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NOV 24 1965

Agricultural Economics Research

OCTOBER 1965 Vol. XVII, No. 4

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UNITED STATES DEPARTMENT OF AGRICULTURE • Economic Research Service

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Agricultural Economics Research

A Journal of Economic and Statistical Research in the United States Department of Agriculture and Cooperating Agencies

OCTOBER 1965 Vol. XVII, No. 4

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Do Lettuce Buyers Exert Oligopsony Power?

By W. Miklius and D. B. DeLoach

FOR MANY YEARS complaints have been heard that retail food marketing is becoming increasingly concentrated in the hands of large food chains which are shifting more and more to direct buying of fresh produce from the shipping point markets. Some farmers claim that direct buying has reduced the number of competing buyers in the shipping point markets and, because of the volume handled, the large chainstores use oligopsony power to depress prices and thus adversely affect growers' incomes.

This paper presents an analysis of the buying practices of three major food chains, hereafter called principal buyers, operating in Salinas, Calif., a primary shipping point market for lettuce. Lettuce was selected for a case study for several reasons. First, the Salinas Valley is a major producing area of summer lettuce in California. During the 1963 shipping season, it supplied about 85 percent of summer lettuce produced in California and about 70 percent of the U.S. total. Second, the market operated without institutional constraints--the California Summer Lettuce Marketing Order was terminated in 1962. Third, lettuce is sold in the fresh market only, which simplifies the analysis.

Fourth, the three largest national food chains operate buying offices in the Salinas-Watsonville area. In the opinions of lettuce shippers, each of these firms was purchasing significant percentages of the total market supply of lettuce. Furthermore, the quantity purchased by the next largest buyer was believed to be considerably lower than that purchased by the smallest buyer of the three chains. Therefore, a priori, the Salinas-Watsonville lettuce market could be characterized as an oligopsony market. The purpose of this study was to explore the validity of this assumption.

The procedure involved (1) an investigation of changes in the number of buyers and sellers in the market, (2) an estimate of the relative volumes bought by the principal chains, and (3) an investigation of the purchasing patterns of principal buyers to learn whether the patterns resemble those which could be expected in an oligopsony market.

Nature and Sources of Data

The three largest national food chains were asked to supply data on their daily purchases of lettuce and prices paid during the main 1963 shipping season. They agreed to supply these data on condition that the three buyers would be treated as a group in the statistical analysis and that the data for individual buyers would not be disclosed. The beginning and ending weeks of the shipping season were excluded, leaving a period from May 13 through September 20. This afforded 19 weekly, and, excluding 3 holidays, 92 daily observations.

A sample of invoices was obtained from the shippers in order to check the reliability of the price data supplied by the three chains. These invoice prices were compared with the daily average prices reported by each chain. In each case, a single observation was compared to a daily average; therefore, the significance of the differences could not be verified statistically without some additional knowledge of the distribution of daily prices. However, the differences were found to be small. For the total sample, the average deviation of invoice prices from the reported average daily price was only \$0.0078 per carton. Thus, the food chains' data were considered reliable.

The reported quantities of lettuce purchased by the principal buyers were estimated from data derived from a stratified random sample of shippers' records. The following sampling plan was utilized: The 1963 directory of the Grower-Shipper Association listed 43 firms selling lettuce. The 1962 market order assessment records listed an additional 5 firms. Six of the 43 firms merged their selling activities and were considered one entity in the sampling. Market order assessment records indicated that four firms made no shipments in 1962. Nine firms were excluded from the sample because each shipped less than 100,000 cartons in 1962. The remaining 30 firms were stratified according to the 1962 market order assessments to give the following distribution:

Size of firm (cartons shipped)	Number of firms	Percent of total volume	Sampling rate (percent)
Over 1,000,000.......	6	51.8	100
500,000 - 1,000,000..	8	25.8	75
100,000 - 500,000..	16	22.3	50

Each contacted shipper was requested to give the number of cartons of lettuce sold to each of the three main buyers during the five randomly selected weeks of the 1963 shipping season.

The chains' data were supplemented by data collected by the Federal-State Market News Service. Two modifications were made in the latter: (1) Reported daily shipments of lettuce were converted from cars and carlot equivalents to number of cartons, using a conversion factor of 640 cartons; (2) the reported "mostly" price, the average of "mostly" price range, or the average of the quoted range, whichever was lowest, was used as an approximation to the average market price. According to the Federal-State Market News Service staff in Salinas, this approximation is closer to the average market price than any available alternative.[1] All prices were for cartons containing two dozen heads of lettuce and exclude the cooling charge.

Changes in Number of Buyers and Sellers

There are no data on the number of buyers in the shipping point market. The only available data pertaining to California middlemen dealing in agricultural commodities are for the entire State. The State licenses five categories of middlemen: (1) agents, (2) brokers, (3) cash buyers, (4) commission merchants, and (5) dealers.[2] In the last 10 years, there was a slight decrease in the total number of licenses issued, as well as some decrease in three of the five categories of licensed middlemen (table 1).

Table 1.--Number of produce dealer licenses issued by the State of California, 1953 and 1963

Type of license	1953	1963
Agent......................	3,944	4,477
Broker.....................	1,413	1,302
Cash buyer.................	795	630
Commission merchant........	1,033	1,130
Dealer.....................	4,080	3,631
Total.................	11,265	11,170

Source: Bureau of Market Enforcement, California State Department of Agriculture.

Another indication of a decrease in the number of buyers is the Salinas-Watsonville F.O.B. Buyers' Association, which in 1964 had 39 members, 9 less than in 1953.

Shipping point buyers compete with buyers located outside of the Salinas market. The available evidence shows that the number of the latter buyers had declined. For example, the Census reports show that the number of produce wholesalers with paid employees in the United States increased from 6,775 in 1948 to 7,389 in 1954 but decreased to 7,259 in 1958. The number of wholesale firms in the wholesale produce market also decreased from 6,492 in 1939 to 5,627 in 1948 and 5,375 in 1958.[3]

The data about the changes in the number of sellers are slightly better. Records of the California Summer Lettuce Marketing Order show that the number of handlers (sellers) of summer lettuce decreased between 1958 and 1961 (table 2). The percentage of total volume handled by the 4 largest and 10 largest handlers also increased slightly.

The trend in other California lettuce producing areas is similar. Records of the California Winter Lettuce Marketing Order indicate a similar decrease in number of handlers (table 3).

A longer time span is covered by data from the Dry-Pack Lettuce Marketing Order, which show a decrease from 84 shippers in 1950 to 27 in 1959 (table 4).[4] The shippers remaining in business are more nearly equal in size. This is indicated by the shift of Lorenz curves over time toward a 45° line (fig. 1).

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[1] For the period under investigation the use of "whichever lowest" prices resulted in a difference of less than 1 cent per carton.

[2] For definitions see Agricultural Code of California, Chapter 6, Section 1261.

[3] A. C. Manchester, "The structure of wholesale produce markets," U.S. Dept. Agr., Agr. Econ. Rpt. 45, 1964, p. 102 and 105.

[4] The California Marketing Order for Dry-Pack Lettuce applies to Santa Barbara and San Luis Obispo Counties only.

Table 2.--Summer head lettuce: Frequency distribution of handlers, by size and percentage of total volume handled, California, 1958 and 1961

Size (1,000 crates handled)	1958				1961			
	Number of handlers	Percent of all handlers	Volume handled (thousand crates)	Percent of total volume	Number of handlers	Percent of all handlers	Volume handled (thousand crates)	Percent of total volume
Less than 1........	4	3	--	--	8	5	--	--
1- 9...........	31	19	137	1	39	27	143	1
10- 49...........	40	24	986	4	29	20	647	2
50- 99...........	22	13	1,647	6	14	10	956	3
100-199...........	25	15	3,640	13	10	7	1,496	5
200-299...........	13	8	3,166	12	15	10	3,828	13
300-399...........	7	4	2,307	8	6	4	2,096	7
400-499...........	7	4	3,032	11	4	3	1,747	6
500-749...........	8	5	4,874	18	9	6	5,317	19
750-999...........	3	2	2,570	9	9	6	7,801	28
1,000 and over.....	4	3	4,883	18	3	2	4,692	16
Total..........	164	100	27,242	100	146	100	28,912	100
Four largest.......	--	--	4,883	18	--	--	5,664	20
Ten largest........	--	--	9,532	35	--	--	10,912	38

Source: Compiled from voting records on amendments to the California Marketing Order for Summer Head Lettuce.

Table 3.--Winter head lettuce: Frequency distribution of handlers, by size and percentage of total volume handled, California, 1958 and 1961

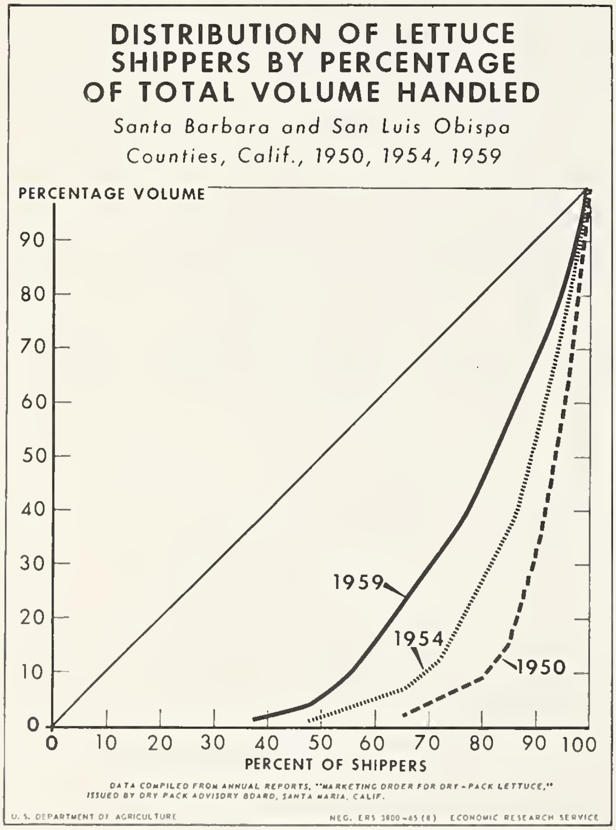
Size (1,000 crates handled)	1958				1961			
	Number of handlers	Percent of all handlers	Volume handled (thousand crates)	Percent of total volume	Number of handlers	Percent of all handlers	Volume handled (thousand crates)	Percent of total volume
Less than 1........	2	3	--	--	1	2	--	--
1- 9...........	1	1	3	1	1	2	3	--
10- 49...........	7	10	199	2	3	5	81	1
50- 99...........	8	11	544	3	7	13	565	3
100-199...........	16	23	2,256	14	14	25	2,112	16
200-299...........	18	26	4,478	28	12	21	3,009	23
300-399...........	8	11	2,804	17	8	15	2,754	21
400-499...........	6	9	2,810	17	6	11	2,547	19
500-999...........	3	5	1,958	12	2	4	1,191	9
1,000 and over.....	1	1	1,034	6	1	2	1,028	8
Total..........	70	100	16,086	100	55	100	13,287	100
Four largest.......	--	--	2,992	19	--	--	2,683	20
Ten largest........	--	--	5,802	36	--	--	5,144	39

Source: Compiled from voting records on amendments to the California Marketing Order for Winter Head Lettuce.

Table 4.--Number of lettuce shippers and percentage of total volume handled by largest shippers, Santa Barbara and San Luis Obispo counties, Calif., 1950-59

Year	Number of shippers	Percent of total volume handled	
		By the 4 largest shippers	By the 10 largest shippers
1950.........	84	43	78
1951.........	56	43	73
1952.........	64	39	68
1953.........	57	41	71
1954.........	50	39	75
1955.........	47	38	76
1956.........	43	42	83
1957.........	39	40	80
1958.........	35	44	81
1959.........	27	46	84

Source: Annual Report, Marketing Order for Dry-Pack Lettuce, issued by Dry Pack Advisory Board, Santa Maria, Calif.



DATA COMPILED FROM ANNUAL REPORTS, "MARKETING ORDER FOR DRY-PACK LETTUCE," ISSUED BY DRY PACK ADVISORY BOARD, SANTA MARIA, CALIF.

Figure 1

Admittedly, the evidence on changes in buyer concentration is rather unsatisfactory. Nevertheless, from the above data it may be concluded that there has been some decrease in the numbers of both buyers and sellers of lettuce.

Volume of Purchases by Three Principal Buyers

Although no data are available to show a redistribution of volume which may have occurred among the buyers, figures collected from the buyers were used to estimate the percentage of total supply of lettuce purchased by them. The estimates reveal that the three largest buyers accounted for a considerably smaller percentage of total daily shipments than most lettuce shippers had believed. During the period under investigation, the three principal buyers never purchased more than 20 percent of total volume. On only 4 days these buyers accounted for more than 15 percent; the average for the 92 days was approximately 10 percent of the total daily shipments (table 5).

Table 5.--Distribution of percentage of total daily lettuce volume purchased by the three principal buyers, Salinas, Calif., 1963

Percent of daily volume	Number of days
0 - 2.4...........................	0
2.5 - 4.9...........................	6
5 - 7.4...........................	9
7.5 - 9.9...........................	26
10 - 12.4...........................	32
12.5 - 14.9...........................	15
15 - 17.4...........................	3
17.5 - 19.9...........................	1
Average 9.945........................	92

Source: Data supplied by buyers and "Marketing lettuce from Salinas-Watsonville and other central California districts, 1963," Sacramento, Federal-State Market News Service, 1964, p. 15.

Because of the discrepancy between a priori expectation and these estimates, their reliability was checked with an independent estimate based on data from shippers' records. The new estimate was made for 5 randomly selected weeks during the 1963 shipping season. During these 25 days the estimated purchases of the three principal buyers never exceeded 20 percent of the market supply. On 11 days the three buyers accounted for less than 10 percent; the average for the 25 days was 11.5 percent of the total daily shipments, compared to the estimated average of 10.4 percent based on data reported for the same days by the principal buyers. The discrepancy between the two estimates can be ascribed to sampling variation; therefore, the estimated percentages of the total supply purchased by the three principal buyers are considered to be valid.[5]

Purchasing Patterns of Principal Buyers

Although oligopoly theory and its counterpart, oligopsony theory, have not reached a stage of development to suggest a single empirical test for oligopsony in a market, the three hypotheses tested below are consistent with the premise that large buyers can affect the market price by varying their purchases.

Hypothesis 1: The three principal buyers pay lower prices for lettuce than other (smaller) buyers. The ability of principal buyers to discriminate may be attributed to the following: (1) Since these buyers account for a significant percentage of the total volume sold, they may induce a shipper to give them price concessions under the threat of withdrawal from the market; and (2) the nature of lettuce production is such that when harvest is completed the production costs are sunk costs, hence the seller, rather than lose a sale completely, may take a price below his long-run marginal costs.

Ideally we would like to compare the prices paid by principal buyers with prices paid by other buyers. Because of the lack of data we have substituted average market price for the prices paid by "other" buyers. To test the above hypothesis the reported average daily market price calculated from Market News reports was compared to the average daily price paid by the three principal buyers. If the average daily market prices were equal to the average daily prices paid by principal buyers, the distribution of differences between the two daily prices would have a mean of zero. Thus, the evidence would be consistent with the above hypothesis if a significant difference from zero is found, i.e., if the t value is found to be outside the confidence interval of ± 1.980 at the 95 percent confidence level. The t value was found to be -5.455 and so we accept the hypothesis that the principal buyers paid prices that were different from the average market price.

However, the average price paid by the principal buyers for the whole period exceeded the average reported market price. Therefore, we tested a statistical hypothesis that the average price paid by principal buyers exceeded the average market price by $0.025 per carton.[6] Again, judging the significance at the 95 percent confidence level the hypothesis would be accepted if the t value did not fall below + 1.658. The t value was found to be + 1.964; therefore, the hypothesis that the principal buyer paid a higher average price than the reported average market price was accepted.

Two problems associated with the above statistical analysis have to be noted. First is a data problem. The average reported market price includes the prices paid by principal buyers. The prices paid by other buyers derived from the average market price, therefore, are biased in favor of the principal buyers if actual prices paid by those buyers are lower than the market average and biased against those buyers if the prices paid are higher.

The second problem refers to the test of the statistical hypotheses. In testing the two statistical hypotheses it was assumed that the populations of average daily market prices and daily average prices paid by the principal buyers have normal distributions. To test this assumption, cumulative frequency distributions were constructed and plotted on probability paper. The considerable deviations of both curves from the straight line indicated that neither population is normal.

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[5] One possible explanation of the fact that only a small share of the market is controlled by principal buyers is their shifting of purchases among various primary shipping point and terminal markets. This, however, seems to indicate that the potential gains from exercise of oligopsony power in one market are smaller than the gains from arbitrage.

It may also be argued that oligopsony power would be negligible with the control of such a small share of the market. On the other hand, economic theory does not provide an indicator as to what percentage of the market has to be controlled for the exercise of some oligopsony power. Primarily for the second reason the analysis of data was continued.

[6] $0.025 establishes a limit to the confidence interval.

Because of the obvious nonnormality of the two populations, the sign test, which does not depend on the assumption of normality, was used to test again the statistical hypothesis that the average daily market prices are equal to the average daily prices paid by the principal buyers. Judging at $\alpha = 0.008$ level of significance we would reject the hypothesis if 33 or fewer plus signs, or 33 or fewer minus signs, were observed. Seventy-two minus signs and 20 plus signs were observed; therefore, we rejected the hypothesis of equality between average market prices and prices paid by the three principal buyers.

Modification of a sign test was used to test the statistical hypothesis that the prices paid by dominant buyers exceeded the average market price. Varying amounts were added to the average market prices and then the sign test was used to determine the critical region within which the resulting distribution of signs was not significantly different from 50:50. Such a critical region was found to be between $0.03 and $0.05 per carton above the market price.

A further investigation of individual buyer data disclosed that the results are affected primarily by one of the three buyers who consistently pays a premium above market price. The average prices paid by the two remaining buyers were not significantly different from the average market price.[7]

Hypothesis 2: The purchasing patterns of the three principal buyers are interdependent. One strategy possible in an oligopsony market is for two buyers to reduce their purchases to avoid bidding up the market price when one buyer purchases heavily.

Three types of combinations in purchases may occur when one buyer increases his purchases: The remaining buyers may both increase, both decrease, or one increase and the other decrease their purchases. Similarly, the same three types of combinations may occur when one buyer decreases his purchases. For the chi-square test the days were counted when different combinations of purchases were observed. The increases and decreases in purchases for each buyer were calculated from his average for the period. If the purchasing patterns of the buyers were interdependent, the number of observations in each category would differ significantly from the expected frequencies. The hypothesis would be accepted if X^2 exceeded 7.38. The contingency table for the chi-square test is presented in table 6. The X^2 value was found to be 2.1272, so the hypothesis that purchases of the buyers are interdependent was rejected.[8] The X^2 tests for each individual buyer gave the same results as for all three buyers combined.

Table 6.--Contingency table of expected and observed frequencies

(Independence in purchases by the three principal buyers)

Purchases by one buyer	Purchases by other buyers			Row totals
	Both above average	Both below average	One below and one above average	
Above average...	35 (30)	37 (38)	58 (62)	130
Below average...	(28) (33)	44 (43)	74 (70)	146
Column totals...	63	81	132	276

Hypothesis 3: The purchases of principal buyers depend on price changes. Some lettuce shippers claim that these buyers reduce the quantity of lettuce purchased when the market price begins to fall. This action causes the price to fall further. When the price is sufficiently depressed, the buyers increase their purchases.

The evidence would be consistent with the hypothesis if we observed that the principal buyers reduced their purchases when the price had decreased from the preceding day, i.e., if the quantity of lettuce purchased on these days was significantly lower than on days when the price either increased or remained the same.

An analysis of variance was applied to the daily purchases by the principal buyers. These purchases were classified into three categories depending on the direction of the price change from the preceding day. The hypothesis would not be accepted if differences among the means of the three categories were not statistically significant. An analysis of variance for these data is presented in table 7. Using the F-test, the value of the F-ratio with 2 and 70 degrees of freedom is 0.77, indicating no significant differences among the categories. To be significant, the value of the F-ratio at the 95 percent confidence level must exceed 3.15.

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[7] A large buyer may discriminate in terms of quality rather than price, i.e., for the same price he may be able to purchase higher quality lettuce than other buyers. Other terms of trade may also differ. Because of the difficulties in quantifying the quality variable this aspect was not analyzed.

[8] Contingency coefficient = 0.087.

Table 7.--Analysis of variance of means of quantities of lettuce purchased

Item	Sum of squares	df	Mean square	F-ratio
Category means	44,117,596	2	22,058,798	$F = \frac{22,058,798}{28,715,887} = 0.77$
Within........	2,010,112,094	70	28,715,887	$F_{.95}$ (2, 70) = 3.86
Total.....	2,054,229,690	72	--	--

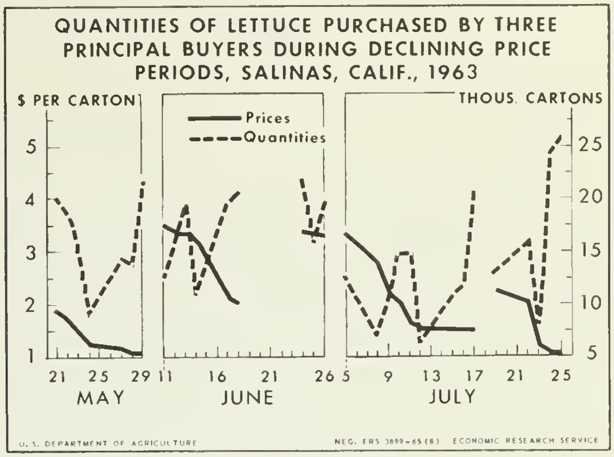

Figure 2

For the F-test, it was assumed that the population of quantities purchased by principal buyers was a normal population. This assumption was tested and it was found that the population was approximately normal.

The foregoing evidence may be questioned because the day-to-day price changes may not be large enough to influence the strategy of buyers. An examination of the price changes during the period under investigation revealed several periods during which the price declined for 3 or more days.[9] The end of some periods of declining prices was marked by increased purchasing by the principal buyers (fig. 2). It was necessary to determine whether there is a significant difference between the average increase in the quantity purchased during periods of price declines and the average increase in the quantity purchased during other periods. A significant difference would be indicated if the t value exceeded + 1.714 at a 95 percent confidence level. The t value was 0.248, therefore we rejected the hypothesis that the increases in quantity purchased during the declining-price period are significantly different from increases in purchases during the periods of increasing or stable prices. The test of normalcy again indicated that the population of increases in quantity of lettuce purchased by principal buyers was approximately normal.

An attempt also was made to test the price leadership hypothesis. The test of this hypothesis, however, proved to be rather complicated and required data that were not readily available.

Conclusions

The results of the analysis are inconsistent with the hypothesis that large buyers exercise oligopsony power in the primary shipping point market for lettuce at Salinas. Although the number of lettuce buyers probably declined during the last decade, the change was neither drastic nor abrupt. It was also offset to some extent by a decrease in the number of shippers.

The three principal buyers account for a relatively small share of the market. During the 92 days of the 1963 shipping season investigated they accounted for approximately 10 percent of the daily market supply of lettuce.

Furthermore, the analysis indicated that the principal buyers paid either the average market price or a higher price. Their purchasing patterns did not show interdependence in the variation of quantities purchased. Nor did the results disclose that the buyers followed a strategy of withdrawing from the market during periods of declining prices.

Although the results are significant, only one commodity market was studied. Other markets should be investigated before any policy implications could be claimed.

The analysis, of course, is subject to the usual difficulties connected with operational definition of theoretical concepts, limitations of data, and available statistical techniques.

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[9] Saturdays, Sundays, and holidays for which no data are available were disregarded.

Income Variability and Farm Size

By Charles V. Moore

THE VARIABILITY, as well as the level, of income affects size of farm and rate of expansion in size. Analysis of income variability may therefore be helpful in providing additional insight and understanding in studies of farm size.

This paper indicates that expansion in farm size may occur less rapidly in some types of farming than usually expected by researchers because of increased risks and limited capacity to pay debts.

The analysis shows the variability of both gross and net farm income for farms on two different soil types in Fresno County, Calif. Then, these variability measures are used in estimating a range within which total cost per dollar of gross income could be expected to fluctuate for observations on the short-run cost curves for farms of different sizes. Further, some conclusions are drawn about the effect of income variability on capital accumulation in farm size studies.

Procedure

A basic assumption in this study, following Tintner's (4)[1] variate difference method, is that a time series consists of two additive parts--an expected or predictable part and an unpredictable or random part. Some researchers (1) think that farmers recognize trends or expected fluctuations in prices and yields and take them into account in their planning. In other words, farmers are sufficiently aware of cyclical and secular trends in prices and changes in technology to include them in their planning formulations. However, farmers have only a subjective estimate of the random deviations away from the expected values. In this study, this random element of the time series after the predictable portion has been removed is of primary interest.

Tintner's variate difference method (4) was used to estimate the random component of these variables, and therefore the "risk," as defined by Knight.[2] This method separates the random from the expected component by a succession of finite differences of a time series. When this procedure has been carried out to the point where the difference between the present and the next preceding series is less than three times the standard error of the present series, we then assume that we have an adequate estimate of the variance of the random component (4, ch. 6).

The correlation between all possible pairs of crops under consideration was calculated to take into account the degree values for one-crop moves in relation to other crops. If the correlation between incomes of two crops is highly positive, adding the second crop to the plan will increase the total variance of the plan. Adding a second crop which is negatively correlated can reduce the total variance.

Variability measures, based on State and county data for prices and yields, were made for eight crops. A deflated cost series of budgeted production items was used in determining variability of net income. The use of State or county data underestimates the variance faced by an individual farmer. This is because individual random fluctuations are "averaged out" in State or county data. This effect is usually greater for yield data than for price data, especially if production is localized, as it is for alfalfa seed and certain other specialty crops (1, p. 179).

Total variance for a cropping plan, for both gross and net income, was determined as follows:

$$\sigma_T^2 = q^2 \sigma_A^2 + (1-q)^2 \sigma_B^2 + 2q(1-q)\, r_{AB} \sigma_A \sigma_B,$$

where q = proportion of land resources devoted to crop A and 1-q = proportion of land devoted to crop B, and r_{AB} = correlation between the incomes of enterprises A and B (2, p. 514).

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[1] Underscored numbers in parentheses refer to items in Literature Cited, p. 113.

[2] A situation where the probability of given outcomes is known and can be insured against (3).

Several farm sizes on two soil types, and crops adapted to these soils, were analyzed to illustrate the above procedure. Gross income-total variance of the cropping plan for each observation on the short-run cost curves (figs. 1 and 2) was calculated as well as the standard deviation. The range within which the short-run cost curve could be expected to fluctuate two-thirds of the time was obtained by dividing total cost first by calculated gross income plus one standard deviation and again by calculated gross income minus one standard deviation.[3] To determine the slope and position of the short- and long-run cost curves, four "fixed plants" were defined in man-years for each of the soil types.[4] These four farm sizes were 1, 2, 4, and 8 man-years of permanent labor force.

Cotton is the major crop adapted to the two soils in this study. The farms in the light sandy soil area also grow alfalfa hay, dry beans, grain sorghum, and barley. Those in the heavy clay soil area grow, in addition to cotton, alfalfa seed, safflower, sugarbeets, beans, barley, and grain sorghum. Two technologies in the production of cotton were examined--solid plant and two-in-one-out "skip row."

The least-cost combination of land, labor, and machinery was determined for each farm size for at least five levels of gross farm income, using linear programming and expected prices. Up to nine combinations of machinery and technologies were analyzed for each level of gross income (level of output). The minimum-cost combination for each level of gross income was determined by dividing total cost (fixed plus variable) by gross income. These least-cost combinations, plotted and joined together, formed the short-run average cost curves for each farm size.

Empirical Results

The broken lines which form a band around the calculated cost curves are determined by dividing the total cost by calculated gross income plus and minus one standard deviation.[5] The width of this band is a function of the cropping program. On the light-soil farms, minimum-cost cropping programs consist of cotton up to the maximum allowed under the acreage allotments, and alfalfa hay. When resources are utilized to their short-run capacity, further expansion of output causes small grains to be substituted for alfalfa hay in the optimum plan. Barley, dry beans, and grain sorghum have high positive income correlations with each other and, when they are added to the cropping plan, they tend to increase the variability.

The heavy-soil farms had a greater variety of crops but were dominated by cotton, sugarbeets, and alfalfa seed. With increased output, small grains come into the program when labor and machinery are being used to capacity. However, the major crops have very low or negative income correlations and this keeps the total variance low.

In the absence of detailed farm data, direct comparisons of total variances among soils and farm sizes are not possible; but I calculated a coefficient of relative variability.[6] Relative variability of gross income is higher for the light soils than for the heavy soils, although both are fairly stable over the range of farm sizes.

COST ECONOMIES

An envelope curve was drawn tangent to the calculated short-run cost curves, to form the planning curve. Envelope curves were also drawn to the plus and minus one standard deviation curves (figs. 3 and 4) to indicate the magnitude of variability around the planning curve.

Costs per dollar of gross income decrease rapidly as initial output expands for farms on

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[3] This assumes that there is a normal distribution of incomes and that time is "fixed," that is, for a large number of independent observations of income, we could be 67 percent confident of obtaining an income within this range. Calculated gross income was used in lieu of expected gross income because prices used were ones projected to 1967. Prices were those projected by ERS, adjusted for local conditions and transfer costs. This modification gives the calculated gross income a slight downward bias.

[4] The detailed procedures for examining economies of farm size are described in "A Study Guide for a Cooperative Project in Economies of Farm Size," prepared by Farm Production Economics Division, ERS, Nov. 1963.

[5] For both the short- and long-run cost curves, zero cost variability is assumed. These confidence bands therefore are the ratio of a constant over a variate and not the ratio of two variates.

[6] $\text{R.V.} = \frac{\text{Standard deviation}}{\text{Calculated income}} \times 100.$

SHORT-RUN AVERAGE COST CURVES
BY FARM SIZE, LIGHT SOILS, FRESNO COUNTY

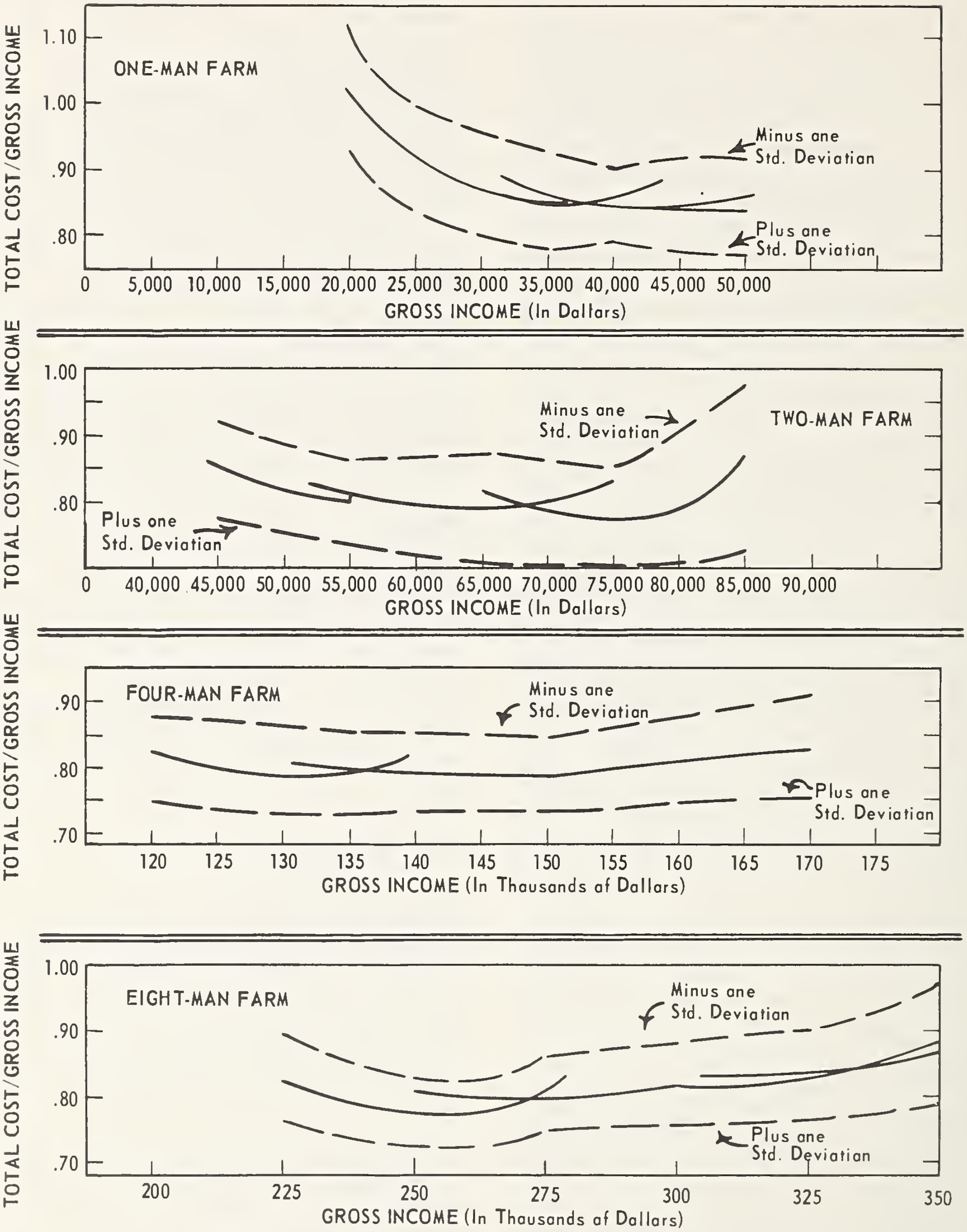

Figure 1

SHORT-RUN AVERAGE COST CURVES
BY FARM SIZE, HEAVY SOILS, FRESNO COUNTY

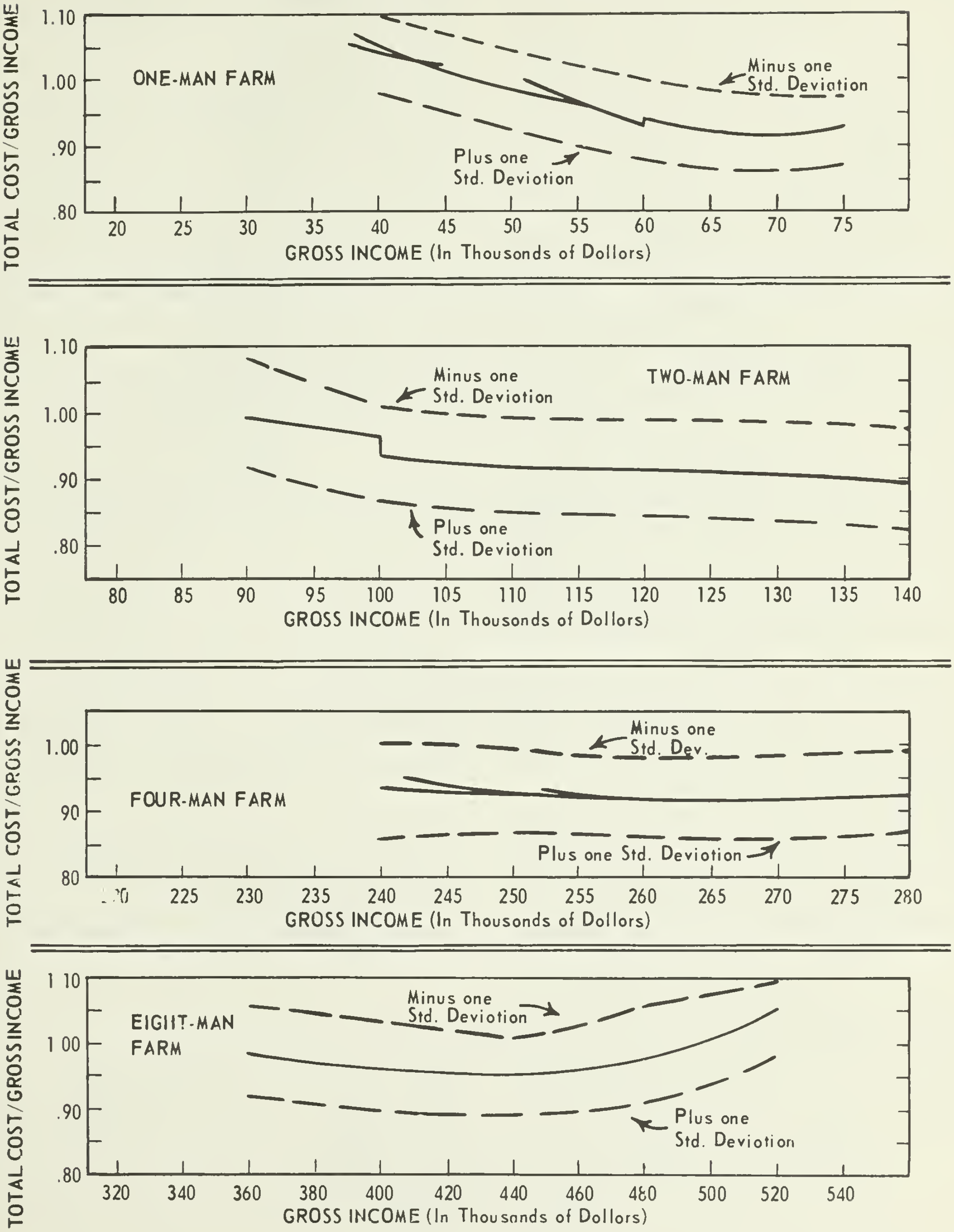

Figure 2

PLANNING CURVE
COTTON FARMS, LIGHT SOIL, FRESNO COUNTY

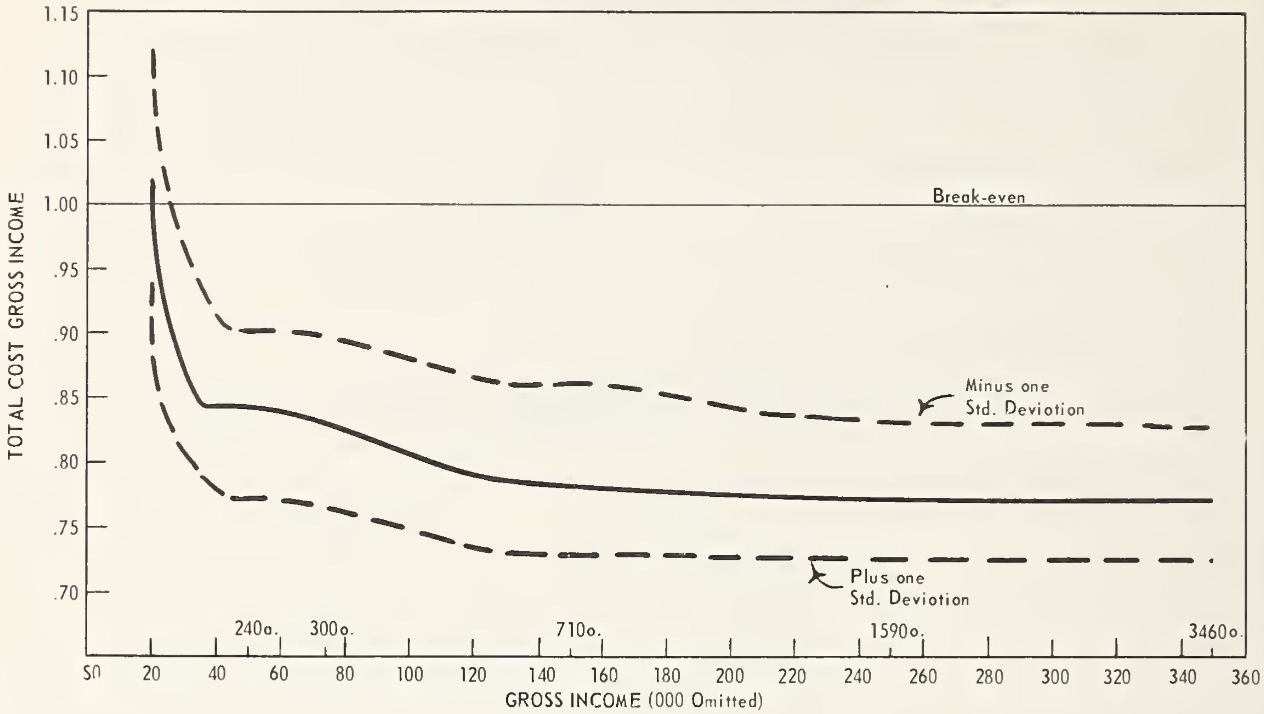

Figure 3

PLANNING CURVE
COTTON FARMS, HEAVY SOIL, FRESNO COUNTY

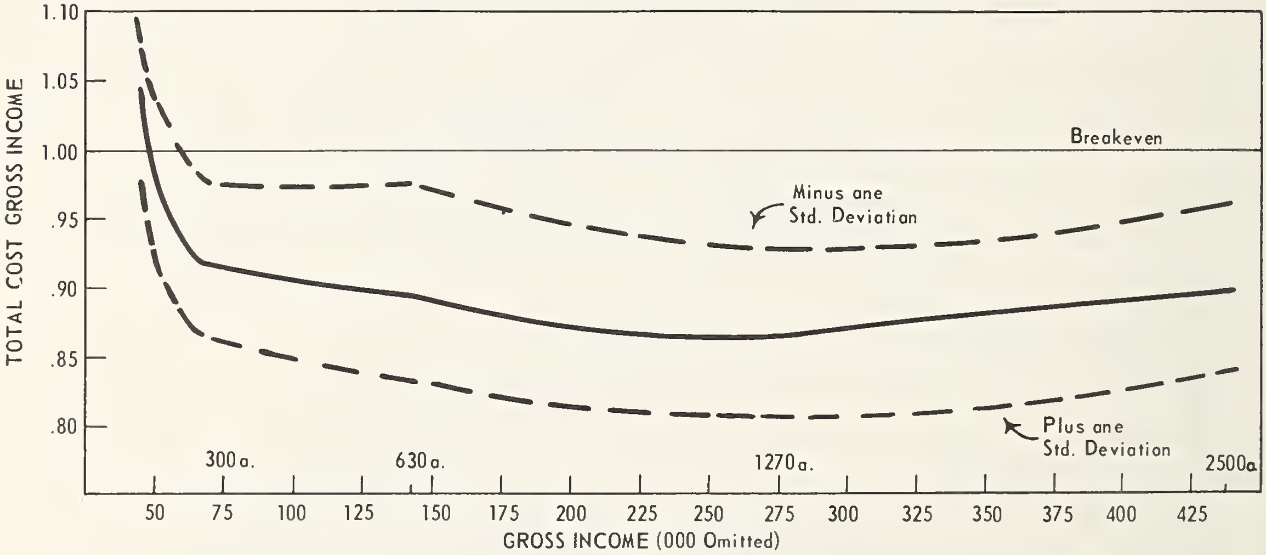

Figure 4

both soils. On the heavy-soil farms, costs reach a minimum of about $0.87 per dollar at $260,000 gross income (1,200 acres). However, plus and minus one standard deviation of gross income about this minimum gives a range from $0.93 to $0.81 per dollar of gross income. An institutional constraint, that causes the cotton allotment as a percentage of cropland to decrease as farm size increases, forces the heavy-soil planning curve to turn upward. At a gross income of $440,000 (about 2,500 acres of land), the calculated cost per dollar of gross income is $0.90, and the range of plus and minus one standard deviation is from $0.84 to $0.96.

Costs decrease throughout the range of output studied for the light-soil farms. Nearly all of the cost savings have been achieved by the time output has reached $140,000 gross income (about 640 acres of land). The calculated cost per dollar of gross income at this point is $0.79, with a range of plus and minus one standard deviation from $0.73 to $0.85.

The same cotton allotments were assumed for the light-soil farms as for the heavy-soil farms. Cotton allotments run from 30 percent of cropland on the one-man farms to 15 percent on the eight-man farms. As farm size increases with the associated percentage decrease in allotments, cotton is replaced by low-value crops such as barley and safflower on the heavy-soil farms; but on light-soil farms, relatively profitable alfalfa hay replaces cotton.[7] This explains why the planning curve turns up on the heavy-soil farms while remaining constant on the light-soil farms.

The bands of plus and minus one standard deviation around the planning curve are narrower for the heavy-soil farms (although the expected incomes are lower) than for the light-soil farms, reflecting the lower relative variability of the heavy-soil cropping plans.

VARIABILITY OF NET INCOME

Since most expansions in farm size are financed in part from earnings retained from income of previous years, an analysis of income variability is germane. Further, since all debt repayment must come from net income, both the absolute and relative magnitudes of the fluctuations must be taken into account.

Variability of net income is the result of the interaction of price, yield, and cost variability. Thus, the relative variability of net income is greater than that for gross income.

Figures 5 and 6 trace out a smoothed estimate of net income for the light- and heavy-soil farms, respectively. These income curves, based on the short-run cost curves, indicate the absolute and relative magnitudes of possible net income fluctuations. Because of the critical nature of minimum net income levels and possible penalties involved in defaulting on loan payments, I have drawn the area encompassed by plus and minus two standard deviations about the calculated net income. Assuming a normal distribution, it would be expected that the net income received in any one year would fall within this range about 95 percent of the time.

For the light-soil farms, only a very small portion of this 95 percent probability area overlaps the negative income portion of the chart. This indicates that a large proportion of retained income could be reinvested in expansion of farm size each year. The debt-carrying capacity of these farms would be relatively high. Only a small reserve would be necessary to meet fixed debt payments in adverse years.

A large part of the area bounded by plus and minus two standard deviations from net income for the heavy-soil farms falls into the negative income area. Although the net farm income would be expected to average out to the calculated farm income over time, the debt-carrying capacity (ability to meet fixed principal and interest payments) of the heavy-soil farms is much less than that of the light-soil farms. Hence, farm expansion from internally generated funds and equity would probably be slower for the heavy-soil areas.

The amount of money available for reinvestment in any one year is further reduced by an allowance for family living expenses. Subtracting a living allowance from net income would cause a large reduction in the funds which could be used to expand farm size.

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(1) Carter, H. O., and G. W. Dean. Income, price, and yield variability for principal

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[7] Including cotton allotments as a restraint causes these curves to be planning curves, rather than true long-run cost curves where all factors are completely variable.

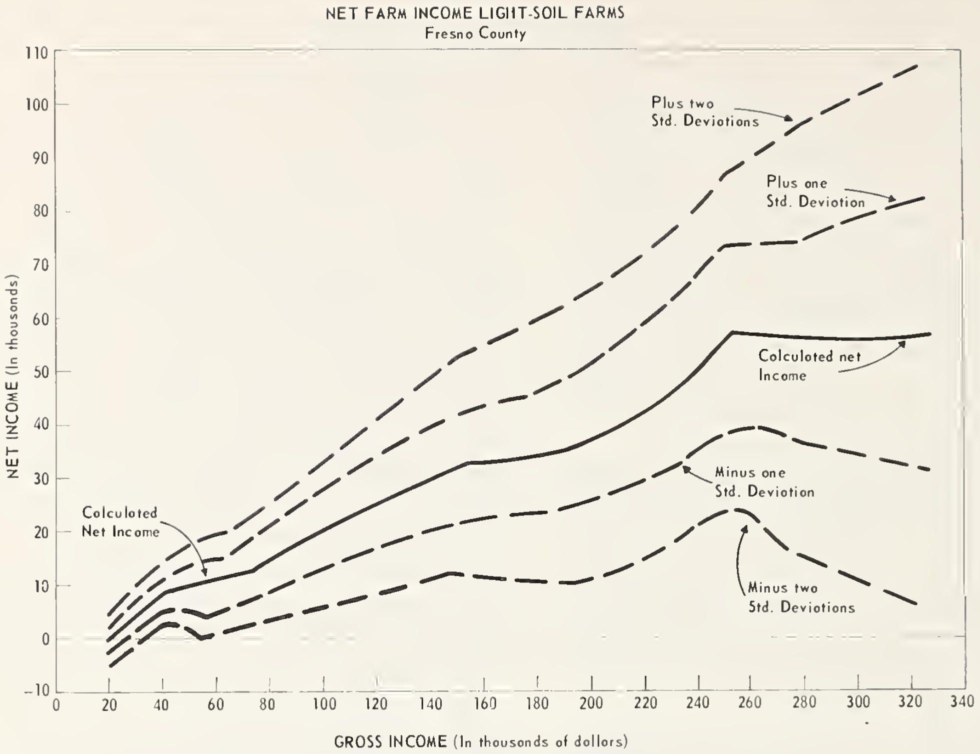

Figure 5

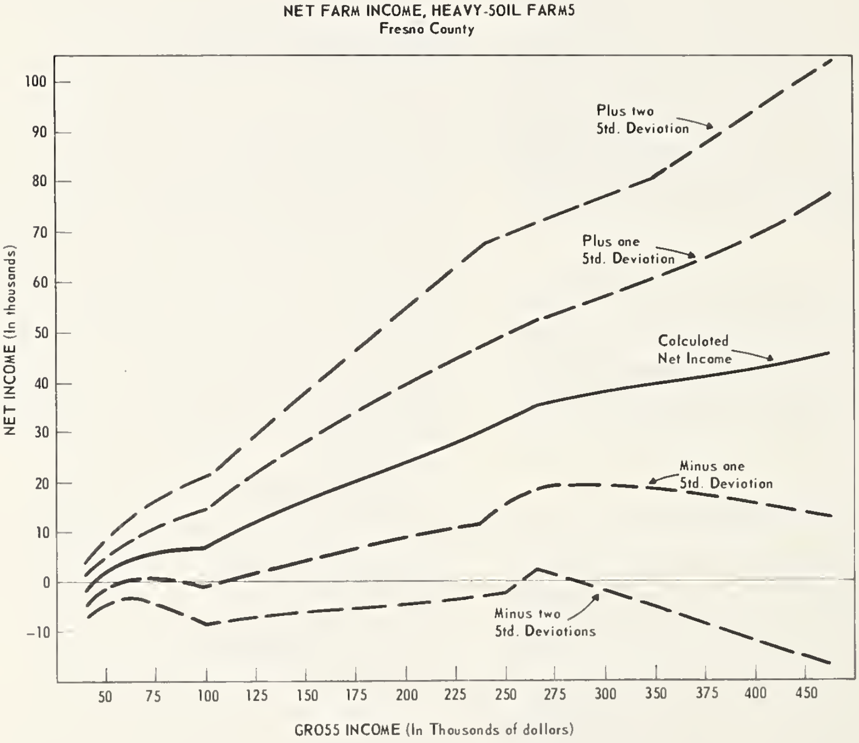

Figure 6

California crops and cropping systems. Calif. Agr. Expt. Sta., Hilgardia 30:175-218, October 1960.

(2) Heady, Earl O. Economics of agricultural production and resource use. Prentice-Hall, New York, 850 pp., illus., 1952.

(3) Knight, F. H. Risk, uncertainty, and profit. Houghton Mifflin, Boston, 381 pp., illus., 1921.

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Emerging Nonirrigation Demands for Water

By Raymond L. Anderson

THE TRANSFER OF WATER from irrigation to nonirrigation uses is an emerging problem of great economic interest. As population grows in the West, water for new and different uses is a limiting resource in many areas. Even where water exists in abundance for established uses, a shift to new uses is often a problem. Any transfer of water rights that influences existing rights on a watercourse frequently becomes involved in litigation. The outcome may prove unsatisfactory to the purchaser of the rights. Inflexibilities in the transfer of water rights force water supply organizations, such as water conservancy districts serving large areas and many users, to play an increasingly important role in transfers to new rural-domestic, municipal, and other nonirrigation uses. Central to the performance of this function is the ability of water users to trade water contracts within the area served by the water supply organization. With water rights held by large water supply organizations, the service contract becomes the key to establishing a new use and to making capital investments to utilize transferred water.

A leading example is the Northern Colorado Water Conservancy District (NCWCD), one of the major water supply agencies of the Western region. This was not organized to be a source of domestic and industrial water, yet it is beginning to feel the demands for changing uses of its water supply. The Colorado-Big Thompson project (C-BT) in Northeastern Colorado was developed to collect, store, and divert surplus water from the upper Colorado River to supply supplemental water to 615,000 acres of NCWCD lands in the South Platte River Basin. Early studies estimated an overall area need for supplemental water of about half an acre-foot per acre. During the first 10 years of full operation the system nearly met this need. But increasing quantities now are being purchased by various organizations for domestic, municipal, and other nonirrigation uses.

During the District's formative period, farmers' applications for C-BT allotments of supplemental water were based upon their estimates of need for additional irrigation water. When an allotment was granted, a tax lien of $1.50 per acre-foot unit per year was attached to the land where the water was to be used. The term "unit" is used because the C-BT project does not deliver a full acre-foot of water in most years. A total of 310,000 units were granted to water users in the District, but during the first 10 years of operation, annual water deliveries averaged 228,845 acre-feet of water or about 74 percent of a full acre-foot.

The need for additional irrigation water varies widely because the present water supplies of companies vary, depending upon their water rights (dates and quantities), and the capacity of reservoirs in relation to amount of land served by the company. In addition, some water allotments from C-BT were granted before the system was completed. Consequently, no one knew for certain what the actual deliveries to individual farms would be. Some farmers would probably have more supplemental water than they needed; others would have less. Hence, provisions were made for seasonal rental and for permanent transfer of NCWCD water allotments.[1]

Approval of the Conservancy District Directors is required for the transfer of a water allotment from one use or location to another and to change the tax lien from the transferor's property to the transferee's. In the last 6 years, more than 11,500 acre-foot units have been transferred to rural-domestic, industrial, and municipal ownership. Actual delivery of water to nonirrigation uses rose from 5,695 acre-feet in 1960 to 26,550 acre-feet in 1964.

Substantial transfers of water to nonagricultural uses were not anticipated when the original allotments were granted. Initially, the municipalities within the Conservancy District reserved about 45,000 acre-foot units for eventual municipal use. Some cities are now purchasing additional allotments to increase their holdings of Conservancy District water. During 1964, for instance, the city of Fort Collins purchased 1,355 acre-foot units and the city of Boulder purchased 1,000 acre-foot units.

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[1] See R. L. Anderson, "The Water Rental Market: A Case Study," Agr. Econ. Res. XIII: 54-58 (April 1961).

Rural-Domestic Systems Develop

One of the largest nonirrigation demands is being created by recently organized rural-domestic water systems that have developed along the front range of the Rocky Mountains in Boulder, Weld, and Larimer Counties, north of the Denver metropolitan area. The purchase of water by domestic water systems has been the primary reason for the rise in transfer price of NCWCD allotments from $30 in 1960 to $100 in 1964.

Ten organizations, nine using C-BT water, have been formed to supply domestic water to farms and rural homes in an area of approximately 1,500 square miles in the three counties. Five rural-domestic water systems are organized as associations financed by the Farmers Home Administration. Others are organized as special districts financed by bond issues.

Rural water systems obtain their water from two major foothill reservoirs operated by the NCWCD. A common technique is to filter the water at the reservoirs, then pipe it along county roads to the water users. As most systems do not provide service beyond the boundaries of existing county roads, customers must provide waterlines from the road to their homesites. Pipes used by the water systems are mainly the new and relatively inexpensive asbestos cement and plastic types.

Water Pricing by Northern Colorado Water Conservancy District

Under the original water service contract, the Conservancy District's annual water charge to agricultural users cannot be more than $1.50 per acre-foot unit of C-BT water. This provision sets a limit on the amount of water revenue available to the Conservancy District. To overcome this restriction on water revenue, the Conservancy District revised its rules to provide that any water allotments reallocated or transferred no longer carry a fixed assessment of $1.50, but are subject to annual rate review by the Board of Directors of the District.[2] Current water charges by the NCWCD are $1.50 per acre-foot unit for irrigation and municipally owned water under original contract, and $3 for water owned by rural-domestic water systems and others under an open-rate contract. Recently the District has instituted a sliding scale for water allotments purchased by municipalities during the last 5 years. This scale will raise the rate to $5 per unit in 1965 and to $15 by 1969. For the time being, the District does not plan to raise the annual rate for water allotments transferred to irrigators or to rural-domestic systems.

Water Rates of Municipal and Rural-Domestic Water Systems

Water charges set by the developing rural-domestic water organizations are much higher than municipal rates in the area (table 1). Municipal rates average 43 cents per 1,000 gallons for 10,000 delivered gallons per month, while rural-domestic charges run from $1.35 to $1.55 per 1,000 gallons at this level of delivery. One city has recently installed water-meters in its service area, making its water rate higher than that in the cities still using a flat rate for most service.

The new domestic water supply organizations initially serve only a few customers per mile of line and are financed by relatively short-term loans and bond issues, except for FHA financing which may be 40 years. To cover fixed charges on the borrowed funds and still have revenue for operation and maintenance, water rates are necessarily high. Most of the organizations are attempting to repay construction costs from water revenue, although those

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[2] NCWCD Rules and Regulations for Reallocation and Transfer of Water Allotments, March 1961, p. 9.

Table 1.--Monthly water rates per 1,000 gallons for selected municipality and rural-domestic water supply systems, Colorado, 1965

Thousand gallons per month	Ft. Collins - Loveland and East Larimer Water District	Little Thompson Water District	Left Hand and Foothills Water Ass'n.	Three municipalities[1]	North Weld County Water District
	Dollars	*Dollars*	*Dollars*	*Dollars*	*Dollars*
4..........	--	--	--	.93	2.06
5..........	1.77	2.40	2.00	.65	--
7..........	--	--	--	.60	1.79
10..........	1.46	1.50	1.35	.43	1.55
15..........	1.07	1.17	1.07	.39	1.18
20..........	.88	.98	.92	.36	1.00
40..........	.59	.66	.61	.31	.61
60..........	.49	.54	.51	.29	.48
80..........	.44	.48	.46	.27	.46
100..........	.42	.44	.42	.26	.45

[1] This is the mean rate for water delivered by meter in Ft. Collins, Greeley, and Boulder. Most water in Ft. Collins and Greeley is sold on a flat fee basis determined by size of house, number of bathrooms, and size of lot. A typical single-family dwelling pays between $40 and $80 per year for water service, depending on size of house and lot area.

organized as special districts have the power to levy an ad valorem tax. Most do not intend to use the taxing powers unless water revenue should be inadequate. The basic water rates were apparently set near costs for water delivered by tank-truck to farmers' cisterns. Many rural homeowners and farmers formerly used trucked water because of the poor quality of well water in the area.

Table 2 shows the retail value of water delivered for domestic and municipal use on an acre-foot basis. While the data are not strictly comparable, rural-domestic water organizations are shown to charge anywhere

Table 2.--Retail value of water per acre-foot in selected municipality and rural-domestic water systems, Colorado, 1965

Thousand gallons per month	Ft. Collins - Loveland and East Larimer Water District	Little Thompson Water District	Left Hand and Foothills Water Assoc.	Three municipalities[1]	North Weld County Water District
	Dollars	*Dollars*	*Dollars*	*Dollars*	*Dollars*
5...........	576.75	780.00	651.70	211.80	--
10...........	474.03	487.50	439.83	140.11	505.00
20...........	285.89	317.85	301.36	117.30	325.80
40...........	191.69	208.00	199.43	101.01	199.43
60...........	160.45	175.50	165.61	94.50	157.47
80...........	144.69	154.66	148.55	87.98	150.59
100...........	135.03	143.00	138.12	84.72	146.25

[1] This is the mean value for water delivered by meter in Ft. Collins, Greeley, and Boulder. Most water in Ft. Collins and Greeley is sold on a flat fee basis determined by size of house, number of bathrooms, and size of lot.

from $780 per acre-foot delivered at 5,000 gallons per month down to $135 per acre-foot delivered at 100,000 gallons per month. Municipal charges for metered water average from $211 to $84 per acre-foot for these amounts. Declining block rates are employed by all domestic water systems in the area. Promotional rates encourage greater use of water but locally are considered desirable from the standpoint of increasing monthly revenue, especially for new systems while they are in the process of repaying construction costs.

In 1958, Renshaw estimated domestic water as having a mean value of $100 and a maximum value of $235 per acre-foot in a study reported in the Journal of American Water Works Association.[3] These estimates appear low when viewed against prices being charged water users under the new systems. Renshaw's estimates do reflect the price of domestic water under established systems as illustrated by the municipal rates shown in table 2. Domestic water users in Colorado apparently do not feel that the water charges made by the new rural-domestic systems are burdensome, because new subdivisions and rural homes are developing rapidly within the areas served by the rural-domestic systems.

Whether the prices charged by the new systems are near the upper limit that domestic users are willing to pay is not known. In the opinion of some farmers, it is not economically feasible to water livestock from sources with such high water rates. The rapid growth of these systems would seem to indicate that demand for domestic water service is relatively inelastic over a wide range of prices.

Hirshleifer, Dehaven, and Milliman state that municipal (primarily domestic) water systems typically overbuild and underprice water supply.[4] Lines as small as 4 inches and even 2 inches are common on the fringes of many rural-domestic systems. The rates set for water service by new rural-domestic systems illustrated in table 2 would substantiate the assertion by Hirshleifer, et al., that domestic water service is somewhat underpriced in many municipalities.

The rural-domestic systems may soon find that the water service they provide is inadequate for the new development taking place in their service areas, and that they will have to enlarge the capacity of the distribution systems. Some trunklines have sufficient capacity to serve more water users but many areas have small lines with little excess capacity to serve future customers. One of the serious problems faced by the new rural-domestic water systems concerns the best strategy for developing waterlines to service present and prospective customers. Because most systems are financed by bond issues backed by a lien on taxable property within the district, efforts are made to include as much property as possible to get a large tax base.

The above points emphasize that water supplies for newly emerging uses are difficult and expensive to acquire in Colorado and probably elsewhere in the West, a chief reason being that, under the appropriation doctrine, most of the available water has been appropriated by irrigation uses, and the holders of irrigation rights are reluctant to allow transfer to emerging uses. When rural-domestic water systems develop, municipalities grow, or new industries come into an area, they compete with irrigation for water supplies and bid up the value of water.

In the case of developing uses within the NCWCD area in Colorado, organizations needing water buy allotments of supplemental irrigation water produced by the C-BT project to supply their needs, not because water is scarce from other sources, but because institutional barriers prevent easy transfer of local water rights.

The rate for raw water delivered by the NCWCD is $1.50 per acre-foot for irrigation use, and $3 per acre-foot for water delivered to rural-domestic water organizations. The price charged for water sold by rural-domestic water organizations ranges from $135 to $780 per acre-foot; for municipalities from $84 to $211 per acre-foot. In view of the high values placed on water by nonirrigation users and the need for expanded water revenues, the NCWCD is raising its water rates to nonagricultural users.

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[3] Edward Renshaw, "Value of an Acre Foot of Water," Jour. Amer. Water Works Assoc. 50:304 (March 1958).

[4] J. Hirshleifer, J. Dehaven, and J. Milliman, "Water Supply," Univ. Chicago Press, 1960, pp. 107-109.

Inflexibility in water transfer under the existing water laws of Colorado has intensified the demand by emerging uses within the Conservancy District for C-BT water. The availability of C-BT water stimulates nonirrigation uses which could not effectively acquire water rights from local sources and probably accelerates economic development within the Conservancy District.

Implications for Transfers of Water to Nonagricultural Uses

Transfer of water to domestic, municipal, and other nonagricultural uses in northern Colorado as reviewed here has several important implications. For example, because most water rights cannot be converted easily from one use to another in Colorado, a heavy burden of emerging uses within the NCWCD will fall on C-BT water. The value of an acre-foot of C-BT water for domestic, municipal, and industrial uses is many times greater than its value for agricultural uses. Superior economic power on the part of domestic and municipal users enables them to bid water away from irrigation users and makes transfers between agricultural users difficult.

Readily transferable water is extremely valuable in an area where all available water has been appropriated. Nonagricultural demands for water are increasing as large areas of farmland are being opened to subdivision development. More than 100 rural subdivisions have been recorded since 1960. Industries also are locating within the NCWCD area, creating a further direct demand for C-BT water. Economic growth will probably take place more readily where transferable water is available.

Rural-domestic systems, municipalities, and industries try to obtain C-BT water because of the certainty of supply, good quality, and ease of acquisition. Other means of obtaining water exist, such as purchasing irrigation or reservoir company stock and small irrigation ditches, or drilling wells. However, these methods do not promise water of known quality and quantity or usability over a large geographic area. Because of physical and institutional barriers, the NCWCD is the logical source for emerging uses of water. Acquisition of water from any other source, such as irrigation rights, local reservoirs, or wells, would involve uncertainties of ownership and quantity or quality that most new owners would not want to risk.

Physical supply of transferable water will not be a limiting factor in the growth of nonirrigation uses, as the C-BT system annually delivers between 225,000 and 300,000 acre-feet of water. The price of C-BT allotments to be transferred will be bid up as nonirrigation users continue to buy water allotments from farmers in the area.

Where there is no new supply of water such as that delivered by the C-BT project, emerging uses will have to compete with established uses. This process usually will require substantial adjustments in existing water allocations and will prove costly to the developing uses. The ability to pay high prices for water will enable domestic, municipal, and industrial users to shift adequate water from irrigation uses or to develop "new" water. If the water is diverted from the older uses, rules and laws governing water allocation will have to be modified to accommodate the emerging needs. Sometimes this is accomplished in the process of changing land uses from agriculture to urban uses. At other times outright purchase of water will be necessary with the consequent adjustments in established uses. Increasing competition should lead to more economical use of water on the part of both irrigation and nonirrigation users.

Concluding Comments

Development of rural domestic water systems to serve areas beyond municipal water systems is a phenomenon that can be expected to accelerate in many irrigated areas of the West. The Farmers Home Administration program for financing water systems serving low-density areas with insured loans will be a helpful factor in developing rural water systems.

Even if more financing should prove necessary, as it has in some instances, the promise of insured loans will be enough to start plans to develop rural-domestic water systems. Once domestic water systems are developed in irrigated areas of the West, real estate promoters from urban areas of the region will look at irrigated lands as potential subdivision sites. California has experienced suburban expansion in irrigated areas for some time. Agricultural areas in Utah, Idaho, Nevada, Arizona, and other Western States that are growing rapidly in urban population, are particularly vulnerable to suburban development.

Book Reviews

Farmers in the Market Economy

Iowa State University Center for Agricultural and Economic Development. Iowa State University Press, Ames. 308 pages. 1964. $4.95.

TWENTY-FIVE PAPERS on market and income problems of farmers were presented at the Iowa Center by economists from colleges, industry, and Government.

In Part I, R. B. Heflebower surveys competition facing farmers and concludes that the main monopoly problem arises from geographical dispersion; this local market power could be lessened by farm cooperatives. Walter W. Wilcox says this survey is good but inadequate; it omits the tendency for big industry and labor unions to raise farming costs. In another paper, John B. Sheahan traces the effects of market power on U.S. economic growth. Kenyon A. Knopf says Sheahan is right about the net adverse effect but says that he wavers too much. Julius Duscha (a newspaperman) examines the "politics of economics" and says that economists get a wrong picture of market competition by abstracting from politically determined allocations.

In Part II, Robert E. Olson examines interindustry flows and their use in making income projections. V. James Rhodes examines four main forces affecting postwar farm income and the extent to which structure and conduct of industry have affected them. Lehman B. Fletcher presents measures of industry concentration and merger. He discusses performance criteria and notes why easy conclusions about the net effects on farmers and consumers cannot be drawn. Lester C. Sartorius and Arval L. Erikson are critical of this method of thinking and its implications. James B. Hassler eschews the "structuralist" approach and gives the "perfect model" approach for evaluating performance. Darrel F. Fienup argues that Hassler should come into the "structuralist" fold and bring his oversimplified method with him.

In Part III, Harold F. Breimyer's thesis is that the organization of agriculture stems from a historical process whose prime feature is the growing use of capital; he discusses critical issues in this light. Richard G. Walsh likes this approach. But he hastens to add that it opens up opportunities for farmers to get income from investing in manufacture of farm inputs. Earl O. Heady argues that if agriculture were to have administered prices (and outputs) this could improve farm income and it would not prevent technical progress or increases in resource productivity; but in the long run the farm income gains would be canceled by competition and capitalization. George K. Brinegar finds that Heady's conclusions stem from a parochial view about man, society, and its compartments, and offers another view.

In their research paper, Gordon A. MacEachern and Vernon W. Ruttan analyze changes in income shares. The contrasting rise in labor's share in the national economy and its decline in the farm economy is briefly discussed in terms of changing factor proportions, technologically altered marginal productivities, and effects of economic reorganization on returns. Luther G. Tweeten examines the usefulness of these estimates in gaging the magnitude of the farm income problem and the effectiveness of programs.

In Part IV, Dale Butz considers the benefits and future possibilities of farm cooperatives. Wendell McMillan examines cooperative bargaining as a way of getting market power. Sidney S. Hoos discusses marketing orders and questions the usefulness of the Federal orders to solve the problem of chronic farm surpluses. Elmer W. Learn examines the possibilities of marketing quotas to raise farm income and says that wheat and milk appear as the only major surplus commodities that currently seem adapted to quotas. Paul L. Farris agrees with these three authors. But he thinks that the issues, to which rigorous supply control devices are offered, themselves have been changing; increasing farm specialization points to increasing interest in bargaining associations and in purchasing and credit arrangements.

In Part V, Winn F. Finner discusses the direction of USDA research on market competition. S. Kent Christensen offers a critique of "market structure analyses" and gives an industry view of research needs. Wilbur Maki is troubled by the problem of problem identification: Economists do not ask relevant questions because they are bound by rigid research procedures. He suggests the "geographical region" as a proper focus for study of growth and efficiency processes.

Reflecting the mixture of issues, interests, approaches, biases, and styles, this book is untidy. But it is provocative. And representing, as it does, a cross section of the economics profession, it contains promising insights and suggestions for further thought and inquiry.

Allen B. Paul

The Concept of Poverty

Chamber of Commerce of the United States. Washington, D.C. 136 pages. 1965. $1.

THIS REPORT is the first in a series of research papers sponsored by the Task Force on Economic Growth and Development as a part of a study on poverty initiated by the Chamber of Commerce in 1964. It is concerned with the definition of poverty, its measurement, and a number of problems about which there is scant information to guide programs to alleviate poverty. The report includes a broad introduction and four technical papers dealing with the history of the problem, some of its theoretical implications, definitions of poverty, and suggestions for a research program.

Poverty is regarded as a relative state, in both time and magnitude, in which individuals, families, and other groups are enmeshed as a result of their inability to participate in the economy. It is labeled a complex condition related to age, education, skills, disabilities, health, motivation, discrimination, depressed economies, etc. The indicated action is stimulation of the economy with simultaneous stress on human resource development. The proper goal is one of opportunity, not guarantee.

The problems in measuring poverty are magnified for lack of a good operational definition and the fact that the meaning of poverty varies over time. Two kinds of measures are suggested. One rests on humanitarian precepts and sets the poverty line at a specific level of income or consumption. The other involves an egalitarian precept based on the number or percentage of the people in the lowest income groups. In general the "market-basket" approach is considered the most desirable of the current yardsticks. This measure assumes that specialists are able to calculate with some exactitude the amounts of goods and services that are needed by an individual or a family. A price tag can then be put on the bundle. Recommendations for research assume that poverty will be defined broadly and that research results will be limited. Poverty is recognized as basically an economic problem but with emotional, cultural, and political aspects. An interdisciplinary research approach is stressed, i.e., an approach involving economics, sociology, statistics, psychology, anthropology, and other fields. Specific projects suggested include:

1. Evaluations of current programs to alleviate poverty.
2. Studies to determine the basic characteristics of poverty emphasizing intergenerational factors.
3. Measuring the relative importance of specific economic and social characteristics of poor people.
4. Analyses of experience in other countries of the world where poverty has virtually been eliminated.

This report is one of the more satisfactory recent treatments of the subject of poverty. However, its organization is not very systematic, it skims over many aspects of the problem with great rapidity, and there seems to be an excessive amount of faith in the ability of others to determine the degree to which people may be poor and to induce basic economic and social changes in a brief period.

It appears that the authors ignore the fact that people can act to block change. Perhaps an initial research step in the study of poverty should be to determine how well the standards of the specialists coincide with those of the people and how fast the process of change can be pushed without imposing undue stress on order, efficiency, and emotions. The report merits the attention of serious readers. It has much to offer the researcher and more to offer officials, administrators, and lay readers who wish to become more knowledgeable on the currently popular subject of poverty.

Olen E. Leonard

The Techniques of Urban Economic Analysis

Edited by Ralph W. Pfouts. Chandler-Davis Publishing Company, West Trenton, N.J. 410 pages. $5.

THIS IS A USEFUL set of writings by economists and planners, representing various appraisals of the economic base theory and the theory's application to some of the challenging issues arising in the field of urban and regional economics. The essence of the theory is the simple thesis that regions with a larger portion of their labor force employed in export--or basic--activity will show greater economic growth than those regions devoting a larger portion of their labor force to local service--or nonbasic--activity. The economic base concept is a spatial-growth concept, which primarily examines base activity as a link between the urban community and the rural areas.

Although this theory has been something of a favorite among planners--with the notable exception of Hans Blumenfeld--most regional economists have been highly critical of it and have gone so far as to subscribe to an alternative: the input-output approach. Several critical writings of the economists are well documented in this book; included among these economists is editor Pfouts, Chairman, Department of Economics, University of North Carolina.

The remarks of James Gilles and William Grigsby, along with those of Charles E. Ferguson, hit the heart of the theory's limitation: the basic-service concept lacks reliability as a forecasting technique. The assumption of constant rates of growth and the exclusive examination of labor force leaves this method too attenuated for prediction.

It seems fundamental that a theory trying to explain the economic complexity of a region by the use of a single yardstick would be doomed to failure from the start. To substantiate this point, Pfouts states that the results of his own empirical test suggest that regional growth is not solely a "function of basic employment." Furthermore, the theory neglects the import side and makes no attempt to examine the effects of income and money-flows within a region. Even the classification of "basic-nonbasic" activity may be misplaced. In some instances, studied areas exist and grow because their business and consumer services provide a base to substitute new export industries for any that decline. If this is so, why shouldn't business and consumer services be classified "basic" and the export sector be classified "nonbasic"?

Planners have suggested that even if the economists' criticisms are valid, the theory nevertheless should be kept as a useful device. I cannot agree with this thinking. If the basic-service concept is of doubtful validity, it cannot be used for prediction; and if it cannot be used for prediction, it has no useful application to planning on the economic or any other level, except for general descriptive purposes.

An input-output analysis is a more comprehensive examination of an economy than an economic base study, in both depth and scope. The input-output approach, in my judgment, is a better tool, despite its high cost, since it is more suited to comparative statics and can be adapted to dynamic problems. In the method, all interindustrial and interregional relationships are integrated by use of an economic matrix, thus producing more detailed results essential for production and policy programs.

Jack Ben-Rubin

Agriculture in Economic Development

Edited by Carl K. Eicher and Lawrence W. Witt. McGraw-Hill Book Company, New York. 415 pages. 1964. $10.

Natural Resources and International Development

Edited by Marion Clawson. The John Hopkins Press, Baltimore. 462 pages. 1964. $7.50.

IN RECENT YEARS the literature on economic growth has been expanding rapidly. These two volumes of essays or "anthologies" on economic growth and the role of agriculture in economic growth represent significant additions to the library of development economics. In the first volume, editors Eicher and Witt have collected some of the more important writings on the role of agriculture in economic development that have appeared in diverse sources over the last decade. They have performed a valuable service by providing us with a convenient and handy reference and survey text of recent writings on agricultural development.

The practice of publishing "nonbooks" or a collection of readings or essays has been on the increase in recent years. The success of publications of this nature depends very heavily upon the ability of the editors to skillfully integrate the articles into a unified treatise of the subject.

Editors Eicher and Witt have endeavored to present the 25 essays in an integrated book form by logically arranging them in four chapters: (1) Agriculture and Economic Development in Historical Perspective; (2) Measurement Problems in the Agricultural Sector; (3) Theoretical Aspects of Agriculture in Economic Development; and (4) Some Aspects of the Process of Change in Agriculture. By presenting these essays in this framework and by prefacing each chapter with editorial comments to establish the connection between the various parts of the book as well as the rationale for selecting particular articles, the editors were able to get away from the conventional "nonbook" form that is so typical of conference proceedings.

This book of readings on agricultural development was collected in response to a growing interest by economists and agricultural economists in the relation of the agricultural sector to general economic development. While the literature on general economic growth has grown rapidly over this past decade, the literature on agricultural development has only emerged in significant volume since 1960. The recent interest in agricultural development grew primarily out of the overemphasis on industrial development in most national development programs during the 1950's, and the growing recognition that economic growth can be better promoted by a balanced effort between industrial and agricultural development. The editors have done a good job in selecting articles that emphasize most of the common tools and approaches that have been used in explaining, initiating, and accelerating agricultural change in countries at different stages of economic growth. This book is designed to provide a systematic exposure to agricultural development literature and should prove useful as a supplementary text for senior-level undergraduate and graduate economic development courses in universities of both developed and less developed countries. It should also serve as a valuable reference book for research and action workers engaged in planning and carrying out development programs. The 25 essays vary in difficulty of reading and comprehension, from the mathematical and theoretical discussions of economic growth theories to the nonmathematical discussion of the historical and policy implications of economic growth. Such variation in readability should enhance the usefulness of this volume to a wide variety of potential readers.

While the first volume concentrated primarily on the role of agricultural development in economic growth, the second volume, "Natural Resources and International Development," deals with the impact of economic growth and development on natural resources and their use, especially in low-income countries. In these countries, capital is usually scarce, manpower is unskilled, and entrepreneurship is weak. If these emerging nations are to improve income per capita for their people, they will need help in both capital and technology. A primary reason for providing help to these countries is our mutual dependence on world resources. By helping the low-income countries to increase their productivity through greater use of their natural resources, we will also be helping them to participate more fully in an interdependent world. These two volumes of readings thus are complementary and supplementary texts in that, taken together, they deal with major aspects of the complex problem of economic growth.

The theme of this volume, edited by Marion Clawson, is "The Role of Natural Resources in International Development"--which was the subject of the 1963 Forum sponsored by Resources for the Future. While this book of essays does not completely cover the complex subject of natural resources and economic growth on a world scale it does provide a good sampling of the thoughts of prominent international economists on this subject. It consists of 10 essays: 3 on commodities or groups of commodities--agriculture, oil, and fisheries; 4 on resource problems in Western Europe, Soviet Union, Africa, and Latin America; and 3 on the problems, potentialities, and hazards of foreign investments in resource development, including the problems of adverse terms of trade by countries exporting raw materials and the transfer of knowledge and capital across national boundaries.

Taken together, these two volumes are good additions to one's personal library or to those of universities and institutions. It is possible that the first volume will receive greater use than the second volume because of the larger variety of subject matter covered and its concentration on a more timely and appealing subject--agricultural development. Nevertheless, many interesting essays in the second volume will broaden the reader's appreciation for the complex and interrelated problems of economic growth and the types of programs that will be required to maximize national and international efforts to promote economic progress in the less developed countries.

Arthur B. Mackie

Introducing Social Change, A Manual for Americans Overseas

By Conrad M. Arensberg and Arthur H. Niehoff. Aldine Publishing Company, Chicago. 192 pages. 1964. $4.95.

ECONOMISTS and economic planners working in the development field should find in this readable little book some interesting insights into the reasons why so frequently planning goals are not achieved according to schedules.

The authors, an anthropologist and a social psychologist, write from a wealth of personal experience in observing attempts, both fruitful and fruitless, to introduce change. Each example is carefully analyzed. For the specialist working in developing countries, there are concrete suggestions on attitudes which might spell the difference between the success and failure of his mission.

Essentially the same text has been published under the title "Technical Cooperation and Cultural Reality," by the Agency for International Development for the use of its personnel.

Jane M. Porter

Oxford Regional Economic Atlas of Africa

By P. H. Ady and others. Oxford University Press, New York. 164 pages. 1965. $15.

THE ENTIRE CONTINENT of Africa is covered in 43 pages of topographical maps, 69 pages of topical maps, 60 pages of economic and statistical data, and a gazetteer. The volume is a major contribution to the economic geography of Africa.

A Dictionary of Economics and Commerce

By J. L. Hanson. Philosophical Library, New York. 401 pages. 1965. $10.

THE PROLIFERATION of specialized terminology in economics and commerce makes this handbook, with over 4,000 entries, a valuable reference, particularly for students. That the author is English adds piquancy to certain of his explanations of terms.

Selected Recent Research Publications in Agricultural Economics issued by the U.S. Department of Agriculture and Cooperatively by the State Universities and Colleges[1]

Bowles, Gladys K. THE HIRED FARM WORKING FORCE OF 1964, A STATISTICAL REPORT. U.S. Dept. Agr., Agr. Econ. Rpt. 82, 30 pp., August 1965.

The report is based on a survey conducted by the Bureau of the Census in December 1964. Among the total hired farm working force, 71 percent were men and boys, and 69 percent were white. More than half were not in the labor force most of the year, chiefly housewives and students. About a fourth of the hired farm working force were primarily engaged in farm wage work most of the year. The median age of farm workers was 25.3 years.

Bowles, Gladys K., and Calvin L. Beale. CHARACTERISTICS OF THE POPULATION OF HIRED FARMWORKER HOUSEHOLDS. U.S. Dept. Agr., Agr. Econ. Rpt. 84, 21 pp., August 1965.

The 3.6 million people who did farmwork for wages in 1962 lived in 2.6 million households in December of that year. The total population of these households numbered 11.2 million persons, or about 6 percent of the total U.S. population. About 27 percent of the farm wage worker population was nonwhite.

Bowles, Gladys K., and Walter E. Sellers, Jr. THE HIRED FARM WORKING FORCE OF 1963, WITH SUPPLEMENTARY DATA FOR 1962. U.S. Dept. Agr., Agr. Econ. Rpt. 76, 63 pp., May 1965.

Of the total 3.6 million hired farm workers in 1963, 53 percent--1.9 million--were noncasual workers who averaged 138 days, earning $883 from farm wage work. The rest--1.7 million--were casual workers who averaged 9 days, earning $54. About 2.4 million persons did farm wage work only, and 1.1 million did both farm and nonfarm wage work.

Boxley, Robert F., Jr. WHITE AND NONWHITE OWNERS OF RURAL LAND IN THE SOUTHEAST. U.S. Dept. Agr., Econ. Res. Serv., ERS-238, 23 pp., June 1965.

Of the 1.3 million individuals who owned rural land in 7 Southeastern States in 1960, 160,000, or about 12 percent, were nonwhite. This group owned more than 8 million acres--about 7 percent of all individually owned land in these States. The average holding of all types of land was 50 acres for nonwhite owners and 95 acres for white owners.

Brown, F. Stanley, U.S. AND RUSSIAN AGRICULTURE--A STATISTICAL COMPARISON. U.S. Dept. Agr., Econ. Res. Serv., ERS-Foreign 127, 7 pp., July 1965.

Presents comparative data on inputs, farm organization, and agricultural output in the United States and the Soviet Union. Except for historical series on area, yield, and production of grain, the comparison is limited to 1963.

Carley, Dale H. LONG-DISTANCE SHIPMENT OF MILK: MARKETING PRACTICES OF BUYERS AND SELLERS. U.S. Dept. Agr., Econ. Res. Serv., ERS-230, 11 pp., June 1965.

Buyers of bulk milk who sell under large contracts often prefer to have some sources of supply outside local areas. More than a fourth of the buyers interviewed obtained some supplies from outside their local areas on a regular basis. The pricing of long-distance shipments of bulk milk either above or below local market prices depends on individual circumstances: Seasonality, State milk market orders, and arrangements with local suppliers.

Chugg, Boyd A. AGRICULTURE IN THE SOUTHEAST ASIAN RICE BOWL AND ITS RELATION TO U.S. FARM EXPORTS. U.S. Dept. Agr., Foreign Agr. Econ. Rpt. 26, 62 pp., June 1965.

The Rice Bowl countries are the Union of Burma, Cambodia, Laos, Republic of (South) Viet Nam, and Thailand. The region is notable for having exportable surpluses of several agricultural products. Rice is by far the most important, followed in order by rubber and corn. The United States and the Rice Bowl countries grow many crops that are noncompetitive. However, a few farm commodities exported by both the United States and the Rice Bowl countries are competing directly in world markets. Of these, rice and corn predominate.

Cowhig, James D. URBAN AND RURAL LEVELS OF LIVING: 1960. U.S. Dept. Agr., Agr. Econ. Rpt. 79, 18 pp., July 1965.

Information on five indicators of level of living (availability of automobile, telephone, hot and cold water piped inside the house, a house in sound condition, and person-per-room ratio) is used to compare urban and rural populations in 1960. Availability of an automobile was the only indicator of level of living reported by a higher proportion of rural than urban households.

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[1] State publications may be obtained from the issuing agencies of the respective States.

Daugherty, Arthur B. WATERSHED PROGRAM EVALUATION, PLUM CREEK, KENTUCKY. U.S. Dept. Agr., Econ. Res. Serv. and Soil Conserv. Serv., ERS-243, 36 pp., August 1965.

Benefits quantified from the Plum Creek Watershed Protection Project represent attainments during 1956-60. Reduction in floodwater damages to agriculture was estimated to be $5,950 annually--$4,460 in crop and pasture damage and $1,490 in other agricultural damage. It was estimated that had all of the watershed improvements been in place prior to 1956, these benefits would have averaged $6,000 and $2,320 annually.

Eiland, J. C. PRODUCTION LABOR REQUIREMENTS IN SOUTHERN RICE MILLS. U.S. Dept. Agr., Mktg. Res. Rpt. 714, 32 pp., June 1965.

Work sampling data were collected in a survey of selected rice mills in the South and labor standards were developed. Findings of the study indicate that if the rice milling industry were to use only the most efficient methods used by the mills studied and perform work at the rates of the standards set in this study, there would be a potential saving in production labor costs of roughly 50 percent.

Freund, William H., and Robert B. Reese. MILK AND MILK PRODUCTS IN THE NATION'S SCHOOLS. U.S. Dept. Agr., Mktg. Res. Rpt. 716, 23 pp., June 1965.

Gains in the quantities of milk sold in schools during the past decade helped stabilize the entire fluid milk market, offsetting what otherwise would be a slight downtrend in total national consumption. The value of milk consumed in schools with lunch services was $285 million in 1962-63. Five years earlier it was $192 million.

Frey, H. Thomas. STATE-OWNED RURAL LAND, 1962; ACREAGE, DISTRIBUTION, USE. U.S. Dept. Agr., Statis. Bul. 360, 11 pp., May 1965.

The 50 States own almost 85 million acres of rural land, not counting road rights-of-way and water areas. About one-third of this acreage is used for parks, State forests, wildlife reserves, and similar purposes. Most of the acreage was acquired through grants from the Federal Government.

Gerlow, Arthur R., and Joe R. Campbell. ENTERPRISE COSTS AND RETURNS FOR BEEF CATTLE; SOUTHWESTERN LOUISIANA RICE AREA. La. Agr. Expt. Sta., DAE Res. Rpt. 337, 55 pp., May 1965. (Econ. Res. Serv. cooperating.)

Provides an economic description of the resources being used by the beef cattle enterprise in the Louisiana rice area and the resulting level of returns. An analysis is also made for beef cattle produced under improved levels of technology and production with emphasis on rotations and improved pasture programs.

Hall, William F. AGRICULTURE IN PAKISTAN. U.S. Dept. Agr., Econ. Res. Serv., ERS-Foreign 129, 28 pp., June 1965.

Contains information on Pakistan's population, agricultural production, livestock, aid, education, agricultural research, land use and tenure, food consumption, agricultural marketing, trade, and transportation. Pakistan's economy is expected to expand by 1975 but not enough to achieve self-sufficiency in food grain production.

Harp, Harry H., and Marshall E. Miller. CONVENIENCE FOODS: THE RELATIONSHIP BETWEEN SALES VOLUME AND FACTORS INFLUENCING DEMAND. U.S. Dept. Agr., Agr. Econ. Rpt. 81, 22 pp., August 1965.

Factors associated with sales of 110 convenience foods were: Cost per serving, degree of competition from similar products, importance of product group in purchase pattern, availability, success of similar items, and special variables for product groups. Using these, logarithmic equations can be set up which may be of use in predicting the success of new products.

Heid, Walter, G., Jr., James E. Martin, and Russell F. McDonald. CHANGING STRUCTURE AND PERFORMANCE OF THE NORTHEAST GRAIN MARKETING INDUSTRY, 1957-1962. Univ. Md. Agr. Expt. Sta., Misc. Pub. 545, 111 pp., June 1965. (Econ. Res. Serv. cooperating.)

Whole grain receipts at terminal elevators declined from 341 million bushels to 226 million bushels during the period studied. Based on estimates of profitable operations, only about two-thirds of the northeastern terminal elevators were operating above minimal standards in 1962. Integration with other grain interests outside the Northeast appeared to be the key to profitable operations.

Herrmann, Louis F., and Elsie E. Anderson. BUTTERFAT SAMPLING AND TESTING PROBLEMS, A NINE-MARKET STUDY. U.S. Dept. Agr., Tech. Bul. 1336, 76 pp., June 1965.

When two milk testers independently sample the milk delivered by producers at a plant and test it for butterfat percentage, the results of the two tests are more likely to differ than to agree exactly. The findings of this study provide approximations of the limits within which results from two properly conducted series of butterfat tests may be expected to agree. Agreement can be checked by comparing the plant averages of test results, or by observing the frequency of differences of specified sizes, in terms of points of butterfat, for individual producers.

Jones, Amos D., and Hoy A. Richards. SCOURING, BALING, AND TRANSPORTING WESTERN WOOLS--PRACTICES, PROBLEMS, POSSIBILITIES. U.S. Dept. Agr., Mktg. Res. Rpt. 723, 117 pp., July 1965.

Baling of grease wool appears desirable by all but the smallest wool warehouses. Various bale dimensions and stacking arrangements are evaluated to achieve maximum use of popular size motor-trailers and rail cars. Scouring wool in the producing area will certainly reduce transportation cost. Statistical equations are developed to estimate the savings for any combination of origin and destination points.

Jones, Lawrence A., and Donald K. Larson. ECONOMIC IMPACT OF FEDERAL CROP INSURANCE IN SELECTED AREAS OF MONTANA AND VIRGINIA. U.S. Dept. Agr., Agr. Econ. Rpt. 75, 36 pp., May 1965.

Federal Crop Insurance payments help rural economies when crop failures lower farmers' incomes. The report describes effects of Federal Crop Insurance on farmers, on businesses that deal with farmers, and on local economies. It also assesses impact of Federal Crop Insurance on other Federal programs.

Kriesberg, Martin. THE MARKET FOR FOOD IN THE NATION'S SCHOOLS. U.S. Dept. Agr., Mktg. Res. Rpt. 702, 54 pp., April 1965.

During 1962-63 foods with a wholesale value of $929 million moved through lunchrooms in about 66,000 public schools. Additional foods valued at $77 million were used in approximately 6,500 private schools. Expansion in school population could result in an increase of as much as 25 percent in the school food market during the next decade.

Looney, Zolon M., Charles A. Wilmot, Shelby H. Holder, and C. Curtis Cable, Jr. COST OF STORING SEED COTTON. U.S. Dept. Agr., Mktg. Res. Rpt. 712, 23 pp., May 1965.

Describes results of a study made to determine costs of three types of seed-cotton storage facilities, analyze the effects of seed-cotton storage on overall ginning costs, and compare the cost of providing seed-cotton storage with the cost of building new plants.

McElroy, Robert C., and Earle E. Gavett. TERMINATION OF THE BRACERO PROGRAM: SOME EFFECTS ON FARM LABOR AND MIGRANT HOUSING NEEDS. U.S. Dept. Agr., Agr. Econ. Rpt. 77, 29 pp., June 1965.

From 1951 to 1964, the bracero program (under Public Law 78) was the chief source of foreign farm labor in the United States. The program enabled entry of Mexican nationals for temporary farmwork. Housing requirements differ for braceros and their potential replacements, the domestic migrant families.

Miklius, W., and D. B. DeLoach. INTERSTATE TRUCKING OF EXEMPT AGRICULTURAL COMMODITIES--CALIFORNIA. U.S. Dept. Agr., Econ. Res. Serv., ERS-216, 27 pp., August 1965. (Univ. Calif. Agr. Expt. Sta. cooperating.)

Truck transportation of exempt agricultural commodities originating or terminating in California during 1963 totaled 3.4 million tons, accounted for 4.2 billion ton-miles, and required more than 200,000 truckloads. The exempt traffic consisted mainly of fruits, vegetables, processed poultry, grains, livestock, and hay.

Moe, Lyle E. ISRAEL: SUPPLY AND DEMAND PROJECTIONS FOR AGRICULTURAL COMMODITIES TO 1975. U.S. Dept. Agr., Econ. Res. Serv., ERS-Foreign 137, 41 pp., August 1965.

Increases in future U.S. agricultural exports to Israel seem probable for such commodities as wheat, feed grains, oilseeds, and tobacco. U.S. exports of dairy products, beef, cotton, and rice may decrease, because of Israel's agreements with the European Economic Community, its increasing trade with the developing countries of Asia and Africa, and changing policies of its government. The report summarizes the major findings of an independently published research study by the Falk Institute for Economic Research in Israel.

Naive, James J., and Gae A. Bennett. U.S. AGRICULTURAL TRADE WITH THE WESTERN HEMISPHERE. U.S. Dept. Agr., Econ. Res. Serv., ERS-Foreign 122, 36 pp., May 1965.

In 1963 U.S. farm exports to Western Hemisphere countries totaled $1.1 billion. Canada, Brazil, Mexico, and Venezuela were the major markets. U.S. agricultural imports from Western Hemisphere countries in 1963 amounted to $1.9 billion; Brazil, Colombia, Canada, and Argentina were the principal suppliers.

Nikolitch, Radoje. THE EXPANDING AND THE CONTRACTING SECTORS OF AMERICAN AGRICULTURE. U.S. Dept. Agr., Agr. Econ. Rpt. 74, 35 pp., May 1965.

The total number of farms declined from 5.8 million in 1939 to an estimated 3.4 million in 1964--a decrease of 2.4 million. But 95 percent of this decline is explained by the disappearance of 2.3 million farms producing less than $2,500 worth of sales. Family farms with $10,000 or more of sales are the fastest growing part of the farm economy. These farms increased 159 percent in number, but their average marketings per farm increased only 20 percent.

Ott, Leland E. FROZEN FOODS: MARGINS, COSTS, AND RETURNS IN RELATION TO DISPLAY SPACE. U.S. Dept. Agr., Econ. Res. Serv., ERS-235, 16 pp., July 1965.

An accounting analysis and an 8-week test were conducted in frozen food departments of a New England food chain. Stepwise multiple linear regression, with zero-one dummy variables and interaction terms, was used to measure the marginal sales and returns for the department and 13 product groups within it. High margins and low variable costs resulted in a net profit (3.9 percent of sales) that was about double the store net of the average chain.

Pape, Eugene C., Jr., and Michael G. Van Dress. ESTIMATED NUMBER OF DAYS' SUPPLY OF FOOD AND BEVERAGES IN RETAIL FOOD STORES, 1963--A CIVIL DEFENSE STUDY. U.S. Dept. Agr., Mktg. Res. Rpt. 713, 82 pp., June 1965.

The number of days' supply of retail food and beverage inventories is shown for counties and independent cities in the contiguous States. Food stocks are shown also by type of storage and geographical distribution among the eight civil defense regions.

Pedersen, John R. ECONOMIES OF SCALE IN TURKEY HATCHERIES. U.S. Dept. Agr., Mktg. Res. Rpt. 719, 41 pp., July 1965.

Based on a survey of turkey hatcheries in the nine major turkey-producing States, the report describes the in-hatchery costs of a sample of turkey hatcheries in 1962 and the effects of economies of scale on the in-hatchery operation of efficient model hatcheries.

Perkinson, Leon B. FATAL ACCIDENTS ON FARMS. U.S. Dept. Agr., Econ. Res. Serv., ERS-245, 7 pp., July 1965.

Although the number of fatal accidents on farms declined during 1954-63, the rate per 100,000 farm people increased. Machinery accounted for 37.6 percent of the more than 9,000 fatal accidents on farms between 1960 and 1963 and was responsible for more fatalities on farms than in mines, quarries, and industrial places combined.

Santmyer, Carolee. ALGERIA'S AGRICULTURAL ECONOMY IN BRIEF. U.S. Dept. Agr., Econ. Res. Serv., ERS-Foreign 131, 8 pp., July 1965.

Agriculture and industry in Algeria have experienced setbacks and, at present, are operating at less than full efficiency. Extensive nationalization of property precipitated a general loss of skilled manpower which has reduced industrial as well as agricultural production. In 1962 Algeria's gross national product was $3,253 million, an average of $301 per capita.

Schaller, W. Neill, and Gerald W. Dean. PREDICTING REGIONAL CROP PRODUCTION, AN APPLICATION OF RECURSIVE PROGRAMMING. U.S. Dept. Agr., Tech. Bul. 1329, 95 pp., April 1965.

Evaluates a relatively new predictive technique called recursive programming, which employs linear programming to generate a series of year-to-year adjustments. A recursive programming model is applied to the problem of explaining and predicting changes in the production of cotton and 11 alternative crops in Fresno County, Calif. Results are compared with actual outcomes and with estimates obtained by using separate regression equations for individual crops.

Shaw, Lawrence H. THE EFFECT OF WEATHER AND TECHNOLOGY ON CORN YIELDS IN THE CORN BELT, 1929-62. U.S. Dept. Agr., Agr. Econ. Rpt. 80, 39 pp., July 1965.

Increases in corn yields in the Corn Belt between 1929 and 1962 are attributable almost entirely to the adoption of hybrid seed, the use of nitrogen fertilizer, and other improved production practices. Although weather affected yields for short periods within the 30-year span, its effect for the entire period was negligible. USDA economists used a weather index to separate the effects of weather and technology on trends in corn yields. Adjusting yields with the weather index shows what yields would have been if weather had been normal in each year.

Smith, Edward J. TECHNOLOGY IN BROILER PRODUCTION: IMPACT ON FEED CONVERSION AND MARKETING WEIGHT. U.S. Dept. Agr., Econ. Res. Serv., ERS-246, 16 pp., August 1965.

A price-mapping method is developed by which optimum marketing weights can be readily determined for a wide range of broiler and feed prices. When used to compare an earlier with a more recent production function, this analytical method indicates that technological change has materially lessened the relative cost disadvantage of heavier broilers. Cost reductions have combined with the ready supply response of the industry to produce a sevenfold expansion in output since World War II.

Stafford, Joseph H., Leland E. Ott, and James C. Snyder. MANAGERIAL ASPECTS OF LEAST-COST FEED FORMULATION WITH LINEAR PROGRAMMING. U.S. Dept. Agr., Mktg. Res. Rpt. 729, 19 pp., August 1965.

Linear programming (LP) can be a valuable management tool for computing feed formulas, anticipating changes in ingredient usage rates, and developing feed specifications. Gross savings of $1.70 per ton were attributed to the use of LP during a 23-week test in two firms. Annual gross savings resulting from the use of LP were projected at $116,000 for one firm and $17,000 for the other. These projections were based on average per ton savings and the average annual production of the six feeds studied.

Stallings, Dale G. LONG-RUN PROJECTIONS OF FOOD PROCESSING AND MARKETING IN THE WEST. U.S. Dept. Agr., Agr. Econ. Rpt. 78, 45 pp., June 1965.

Surpluses of production over consumption of fruits, vegetables, and some other farm foods in the Western States are projected to increase by three-fourths from 1960 to 1985. The area is expected to have deficits of other foods, principally meat, poultry, flour products, and some dairy products. The study is one of three recent reports by USDA appraising the long-term outlook for producing, processing, and marketing agricultural commodities in the 11 Western States.

Twining, Carl R., and Peter L. Henderson. PROMOTIONAL ACTIVITIES OF AGRICULTURAL GROUPS. U.S. Dept. Agr., Econ. Res. Serv., 30 pp., June 1965.

A 1963 survey of U.S. agricultural groups showed that nearly 1,200 groups allocated funds to conduct their own commodity promotional programs. These groups spent a total of about $86 million during 1962 to promote agricultural products.

Van Dress, Michael C. ESTIMATED NUMBER OF DAYS' SUPPLY OF FOOD AND BEVERAGES IN ESTABLISHMENTS THAT SERVE FOOD FOR ON-PREMISE CONSUMPTION--A CIVIL DEFENSE STUDY. U.S. Dept. Agr., Mktg. Res. Rpt. 707, 82 pp., May 1965. (U.S. Dept. Defense cooperating.)

Eating places and institutions serving food have enough supplies on hand to make 1 billion meals. Food supplies in restaurants, colleges, hospitals, and other establishments equal 1.9 days' food for each person in the United States. Beverages on hand equal a 1.2-day supply per person.

Vosloh, Carl J., Jr. INGREDIENT HANDLING BY FEED MANUFACTURERS: CAPITAL AND LABOR REQUIREMENTS. U.S. Dept. Agr., Mktg. Res. Rpt. 727, 31 pp., July 1965.

In recent years the receiving operation of feed mills has increased in efficiency with bulk handling. Bulk ingredients are cheaper and handling costs are less. Two models handling 80 and 200 tons of ingredients a day are used to compare costs and efficiencies. Equipment costs $64,280 for the smaller model and $101,110 for the larger model. Costs of operating alternative pneumatic equipment comparable to mechanical equipment used would be between 8 and 16 percent more.

Warren, Cline J., and Carolee Santmyer. AGRICULTURE OF NORTHERN AFRICA. U.S. Dept. Agr., Econ. Res. Serv., ERS-Foreign 128, 56 pp., June 1965.

Although significant industrial gains are underway in some North African countries, these countries all retain predominantly agricultural economies. Two-thirds of the people are rural dwellers and depend upon agriculture for a livelihood; most urban dwellers are engaged in processing or trading agricultural products. With the exception of the Nile valley and delta in the United Arab Republic, Northern Africa is not densely populated. Less than 1 percent of the total land area is under cultivation.

Wooten, H. H. THE LAND UTILIZATION PROGRAM, 1934 TO 1964: ORIGIN, DEVELOPMENT, AND PRESENT STATUS. U.S. Dept. Agr., Agr. Econ. Rpt. 85, 85 pp., August 1965.

Conversion of farmland to other uses became a large-scale Government program 30 years ago. Before that time many farmers had cultivated land which produced little, because of damage from severe droughts, floods, erosion, and poor land practices. The Federal purchase program for land utilization emerged as a solution to these acute land problems in 1934. The total cost for land and development was $150 million by 1954. Additional development and improvements have continued to the present.

Wright, Bruce H. CHANGES IN TRANSPORTATION USED BY COUNTRY GRAIN ELEVATORS IN THE NORTH CENTRAL REGION, 1958-63. U.S. Dept. Agr., Mktg. Res. Rpt. 724, 35 pp., July 1965.

Between 1958 and 1963 the percentage of all grain shipped by truck from country elevators in the North Central region increased from 30.3 to 40.8 percent, and barge shipments increased from 1.4 to 2.1 percent. Rail shipments declined from 68.3 to 57.1 percent. Changes in the kind of transportation used by country elevators to ship grain depend in part on what rates and services each mode can offer shippers, and on distances involved.

U.S. Department of Agriculture. FOOD BALANCES FOR 8 EAST EUROPEAN COUNTRIES, 1959-61. Econ. Res. Serv., ERS-Foreign 124, 16 pp., May 1965.

East European countries have 10 percent of the world's population. In 1959-61 they consumed 14 percent of the estimated world calorie intake. Less than 10 percent of the total food supply of the eight countries was imported.

U.S. Department of Agriculture. WATERSHED PROGRAM EVALUATION, EAST WILLOW CREEK, MINNESOTA. Econ. Res. Serv. and Soil Conserv. Serv., ERS-231, 31 pp., May 1965.

Investment in all works of improvement installed in the East Willow Creek Watershed Project between 1954 and 1960 totaled $392,407. Net farm income in the watershed increased nearly $100,000 a year following installation of the project measures. This gain was due to higher crop yields, more intensive use of cropland, and larger numbers of livestock.

U.S. Department of Agriculture. U.S. FOOD CONSUMPTION; SOURCES OF DATA AND TRENDS, 1909-63. Statis. Bul. 364, 194 pp., June 1965.

Provides detailed figures, by commodity, on supplies and use, per capita consumption, and the nutritive value of foods. Food consumption has altered as the country has grown. The average person ate only half a pound of frozen vegetables in 1937, but 7-1/2 pounds in 1963. Poultry, once a luxury, is commonplace due to the high efficiency of agriculture. Data in the publication were derived mostly from independent estimates of production or marketings of farm products, foreign trade, and stock changes.

U.S. Department of Agriculture. FARM COSTS AND RETURNS: COMMERCIAL FARMS BY TYPE, SIZE, AND LOCATION. Agr. Inf. Bul. 230, 97 pp., revised August 1965.

Contains summary estimates of costs and returns for 1964 and earlier years on 42 important types of commercial farms in 24 major farming areas in the United States, together with a brief analysis of changes that have occurred in production, prices, income, and costs for each type of farm.

U S GOVERNMENT PRINTING OFFICE 1965 O—789-683

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AGRICULTURAL ECONOMICS RESEARCH

Is published quarterly by the Economic Research Service, U.S. Department of Agriculture. Use of funds for printing this publication approved by the Director of the Bureau of the Budget (July 31, 1964).

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402. 25 cents a single copy, $1 a year domestic, $1.25 foreign.